TECHNOLOGY DEPT.

Grinding and Finishing

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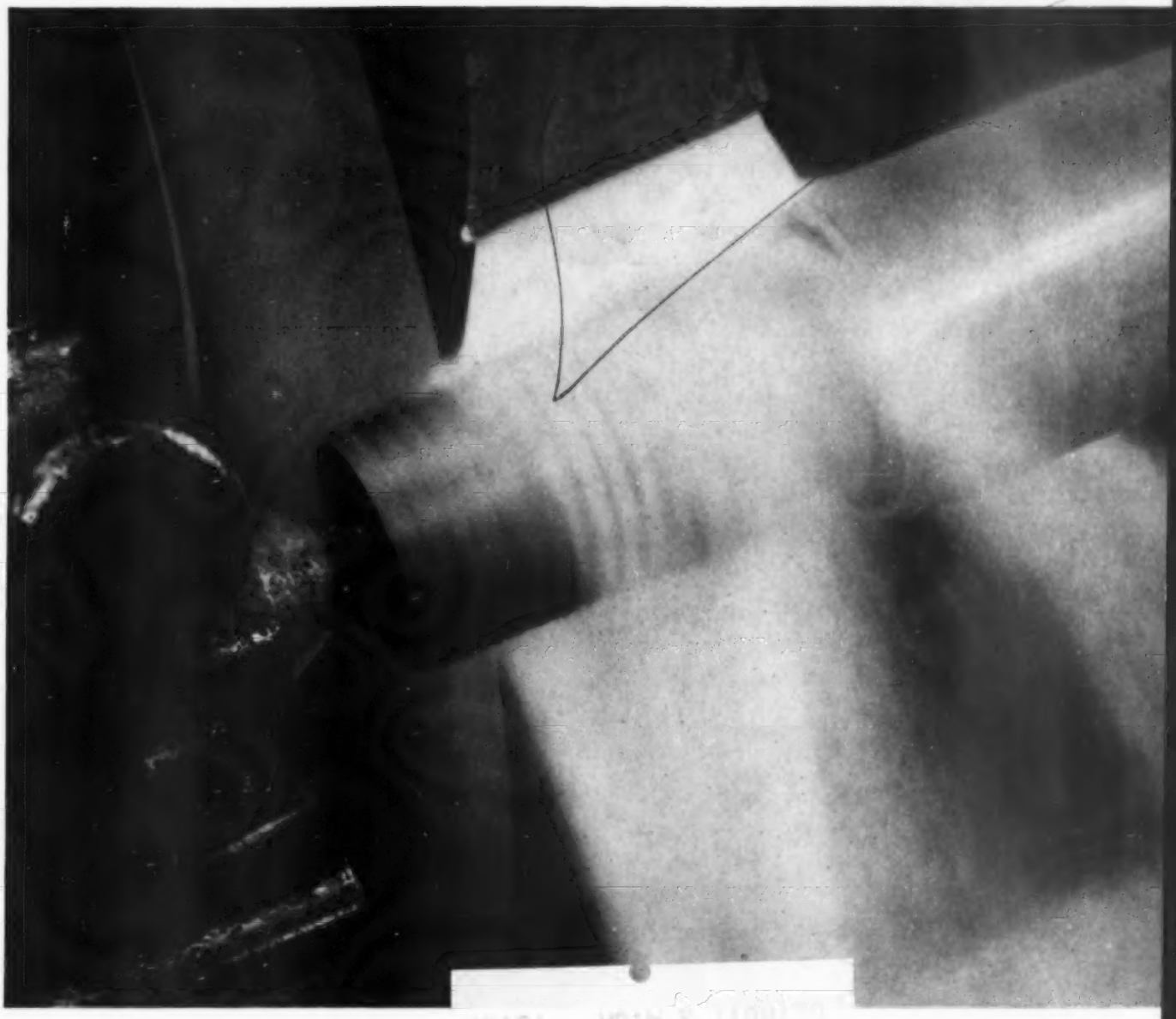
in this issue:

High-Powered Grinding for Fast Stock Removal —page 29

Lapping with Diamonds —page 32

How to Finish the Stainless Steels —page 39



ange in coolant solves two
oblems —page 36

a hitchcock publication

Heald announces a

NEW DEVELOPMENT

that will mean important savings in the cost of internal grinding

Here's the first official report on the new RITE-ANGLE Centri-Matic

by Clifford G. Menard.
Chief Engineer, Grinding Division

Any new development that can cut grinding time by up to 50 per cent is important news. And since our new RITE-ANGLE Centri-Matic internals will do just that, some inside information on how this rather startling improvement was brought about may be of interest.

In order to permit heavier feeds and faster stock removal, we have inclined the wheelhead table at a 30 degree angle to oppose feeding and grinding forces to best advantage.

With this new RITE-ANGLE construction, stock can now be removed at the rate of two cubic inches per minute without any distortion or unwanted movement of the table, keeping the wheel properly buried in the work. This compares to a previous maximum stock removal of about one cubic inch per minute.

The Model 190A and 1901A Centri-Matics utilize a new cycle and compensating diamond arrangement, especially designed to take full advantage of the faster feeds and automatically maintain optimum grinding intervals under varying conditions of work size and stock removal. Spindle pressure against the work during all portions of the grinding cycle is measured by an ammeter on the control panel, permitting proper roughing and finishing pressures to be established during the set up. The feed box controls will automatically maintain these pressures during the production cycle.

The RITE-ANGLE design can be likened to an iron hand in a velvet glove — giving greater strength where strength is needed, yet retaining the extremely high precision that is so essential to bearing race work.

for further details, fold out facing pages

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New RITE-ANGLE CENTRI-MATIC

cuts grinding time as much as 50%

A NEW ANGLE in internal grinding gives greater strength and rigidity for faster stock removal, with highest accuracy and precision

The Heald RITE-ANGLE Centri-Matic represents the latest and most advanced design in the field of high-precision internal grinding. It includes all the basic advantages of other Heald internals — plus the added feature of substantially increased production rates. Mounting the wheelhead table at a 30° angle provides greater strength and stability and permits much faster stock removal.

Production economies due to faster grinding cycles are improved in all sizes of work handled on this equipment, but are most apparent in the larger (up to 4½" O. D.) sizes, where grinding time can be reduced as much as 50%.

This new RITE-ANGLE design is now available in the Model 190A Centri-Matic for straight and taper bores, and the Model 1901A Centri-Matic ball track grinder — both machines providing a new high in production, with maximum accuracy and precision, for work up to 4½" O. D. Ask your Heald representative for complete information or send for a copy of new RITE-ANGLE Bulletin.

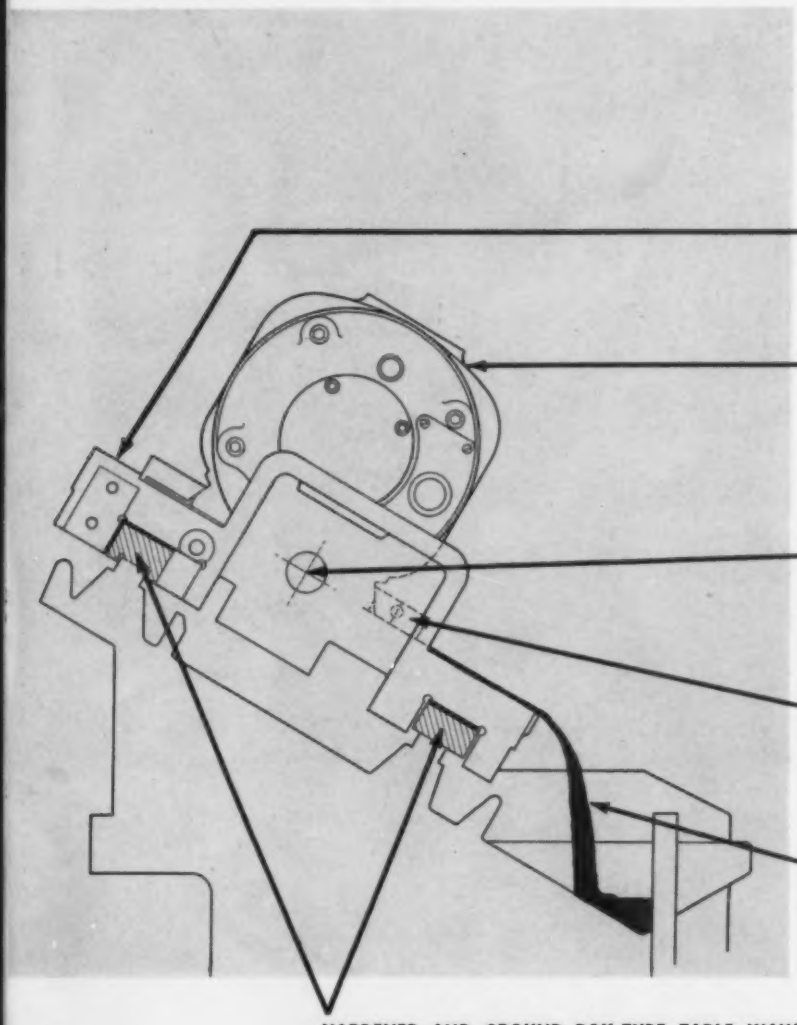
OTHER ADVANTAGES

- Choice of Hi-Frequency or Belt-Driven Wheelheads
- Vee-Way Accuracy of Alignment with hardened and ground box-type table ways
- More Efficient Swarf and Coolant Disposal
- Infinitely Variable Hydraulic Cycles
- Automatic Feed Control with Self-Adjusting Diamond

IT PAYS TO COME TO HEALD!

HEALD

Model 190A for straight or tapered bores and Model 1901A for ball track internal grinding now feature Heald's unique inclined-table design



These RITE-ANGLE features mark a major advance in the performance and economy of internal grinding

30° WHEELHEAD TABLE provides maximum strength and rigidity for heavy stock removal — cuts total cycle time in *half* for larger size work.

HIGH PRECISION RED HEAD WHEELHEADS, of either the hi-frequency or belt-driven type, have more than ample capacity for the heavier feeding pressures and faster stock removal used on these RITE-ANGLE machines.

TABLE CYLINDER PISTON ROD is attached to the table close to the center of mass, keeping reciprocating forces in-line with table motion and assuring highest accuracy and precision under all conditions.

INFINITELY VARIABLE HEIGHT ADJUSTMENT OF WHEELHEAD, particularly for taper work, is provided by a tapered gib mounted with the wheelhead on the inclined table.

SWARF AND COOLANT drain directly off the table and into the coolant tank, preventing fouling of the ways or contamination of the hydraulic fluid or coolant.

HARDENED AND GROUND BOX-TYPE TABLE WAYS with large contact area, are built to last a lifetime. Front and top surfaces of upper way form a long, vee-angle guide which assures permanent, high precision table-tracking.

Fully Automatic Machines for Small to Medium Work

The Model 190A and 1901A provide maximum production with highest accuracy and precision for work up to 4½" O.D. Shoe-type centerless workholding tends to bridge any waves present in the O.D., producing perfect concentricity while reducing the possibility or repeating waves in the bore or raceway. Fully automatic cycling, including interlocking loading and unloading, permits one operator to handle a group of machines. Setting up is simple, too, as the hydraulic cycle adjustments are infinitely variable and readily accessible.

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the magazine of abrasive metalworking operations

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BPA

Grinding and finishing

FEATURE ARTICLES

High Power for Fast Grinding 29
More beef and power help giant surface grinders push back the frontiers of stock removal, as Mattison puts on a show. By Jack Kenyon.

Lapping with Diamonds 32
Metalworking applications for diamond compounds have multiplied rapidly since their introduction as a carbide-tool finishing medium.

Wax-Type Coolant Solves Two Problems 36
Rust and rancidity plagued this shop, tool life was low. Switch to wax-type coolant improved operations.

A Guide to Stainless Steel Finishing 39
Stainless isn't necessarily difficult, but just different. Comprehensive treatment of surface finishing techniques. By W. E. McFee.

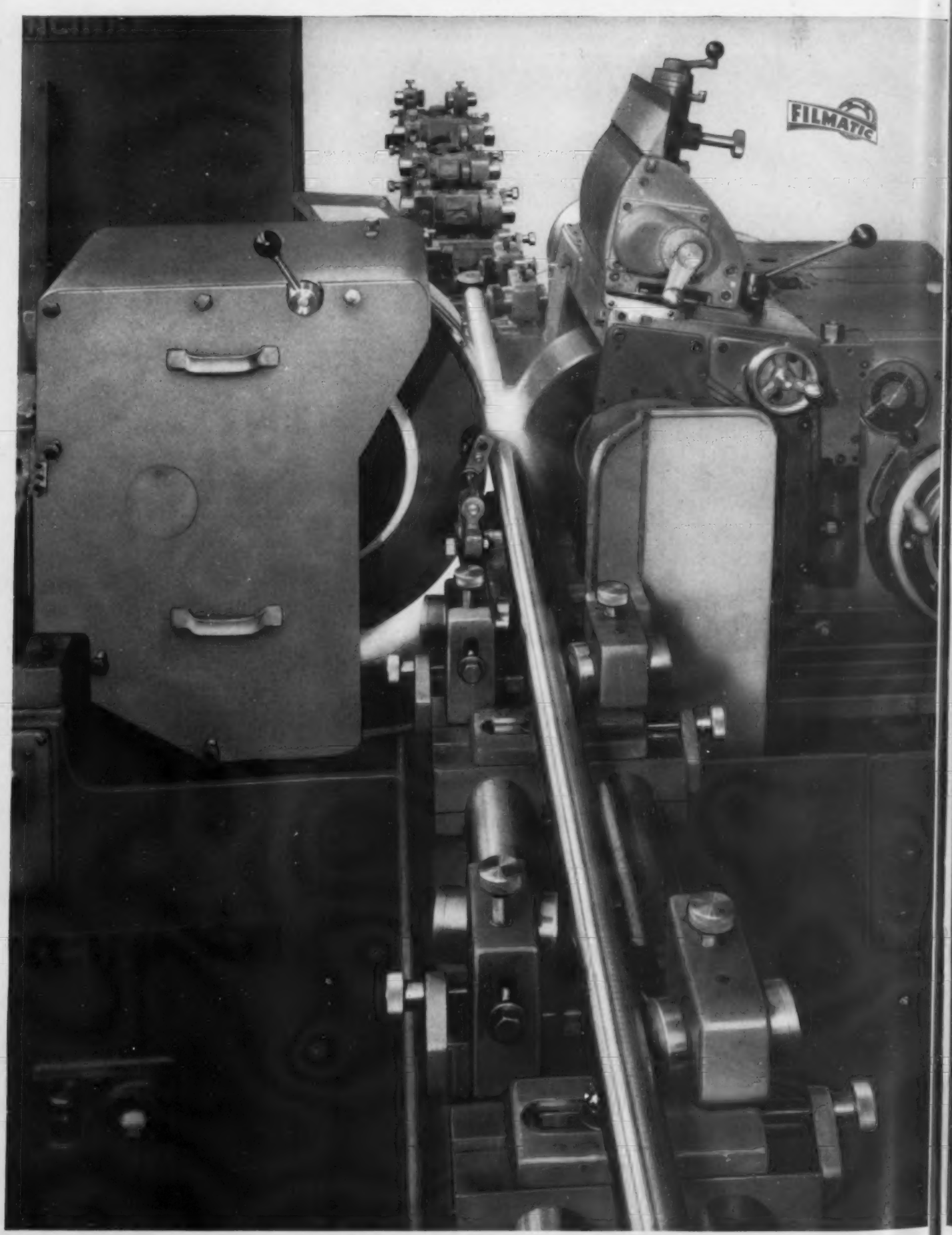
Horizontal Spindle Surface Grinding 45
Part 4 deals with wheel selection, forming and dressing. By Grinding and Finishing *staff.*

How to Dispose of Soluble Coolants 54
Soluble oil emulsions have been a tough disposal problem in face of tightening pollution laws. Here are proven methods. By R. K. Gould and W. F. Ball.

DEPARTMENTS

Letters 6
Industry Observer 12
Editor's Page 27
Grinding Safely 67
Free Literature 69
New Equipment and Materials 75
News of Industry 90
Index to Advertisers 99

COVER: GRINDING PISTON ROD at GM's Euclid Division, St. Clair plant. Use of waxy coolant in plant's 60 cutting and grinding machines is credited with elimination of rust, sharp reduction in rancidity and improved tool life, after a year's trial.



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Letters to the Editor

Diamond Cutter Dressing

I want to compliment you very much on the articles in the May issue of Grinding and Finishing on the Jones & Lamson Machine Company and Koebel Diamond Tool Co. joint development.

All who have seen it agree with me that it is the best that has been presented on the subject.

Charles J. Koebel
Koebel Diamond Tool Co.
Detroit

Grinding at Volkswagen

Just a note to point out a typographical error on page 45 of the May Issue. The 24" diameter wheel could not be used at 5,460 rpm. At 6500 sfpm, the machine would be running at 1034 rpm. Could you possibly have meant sfpm.

We would like to know more about how they get two to six micro inches with 60 grit wheels. Professor McKee at the University of Michigan showed this to be possible due to the choice of coolants. Possibly you may get him to enlarge on this issue.

W. S. Netter
Director of Manufacturing
Keystone Abrasive Wheel Co.

Speed on the operation should have been given as 6000 sfm, as Mr. Netter and other sharp-eyed readers have suggested. On the surface finish question, R. E. Reason in his articles "Significance and Measurement of Surface Finish" (GRINDING AND FINISHING, Sept.-Nov. 1956) pointed out that dressing was a vital factor in finish obtained from a given wheel.—Ed.

Society for Abrasives

Thank you for the interest you have shown in the American Society for Abrasives.

The thoughts expressed in your

(*Continued page* 10)

(PATENT APPLIED FOR)

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MANHATTAN SAFETY BACK FLARED CUP

Not simply a new safety "feature" . . . not merely a design "improvement." Here's a *totally new concept* of flared cup wheel design *and* construction . . . developed by Manhattan engineers to give the greatest safety and performance advantages possible for flared cup wheel users. Manhattan's revolutionary SAFETY BACK Flared Cup puts portable wheel *safety* where it counts the most—in *original* strength and breakage resistance!

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Let a Manhattan abrasive wheel engineer show you the advantages of SAFETY BACK Flared Cups, and other types of Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

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WRITE TO THE ABRASIVE WHEEL DEPARTMENT

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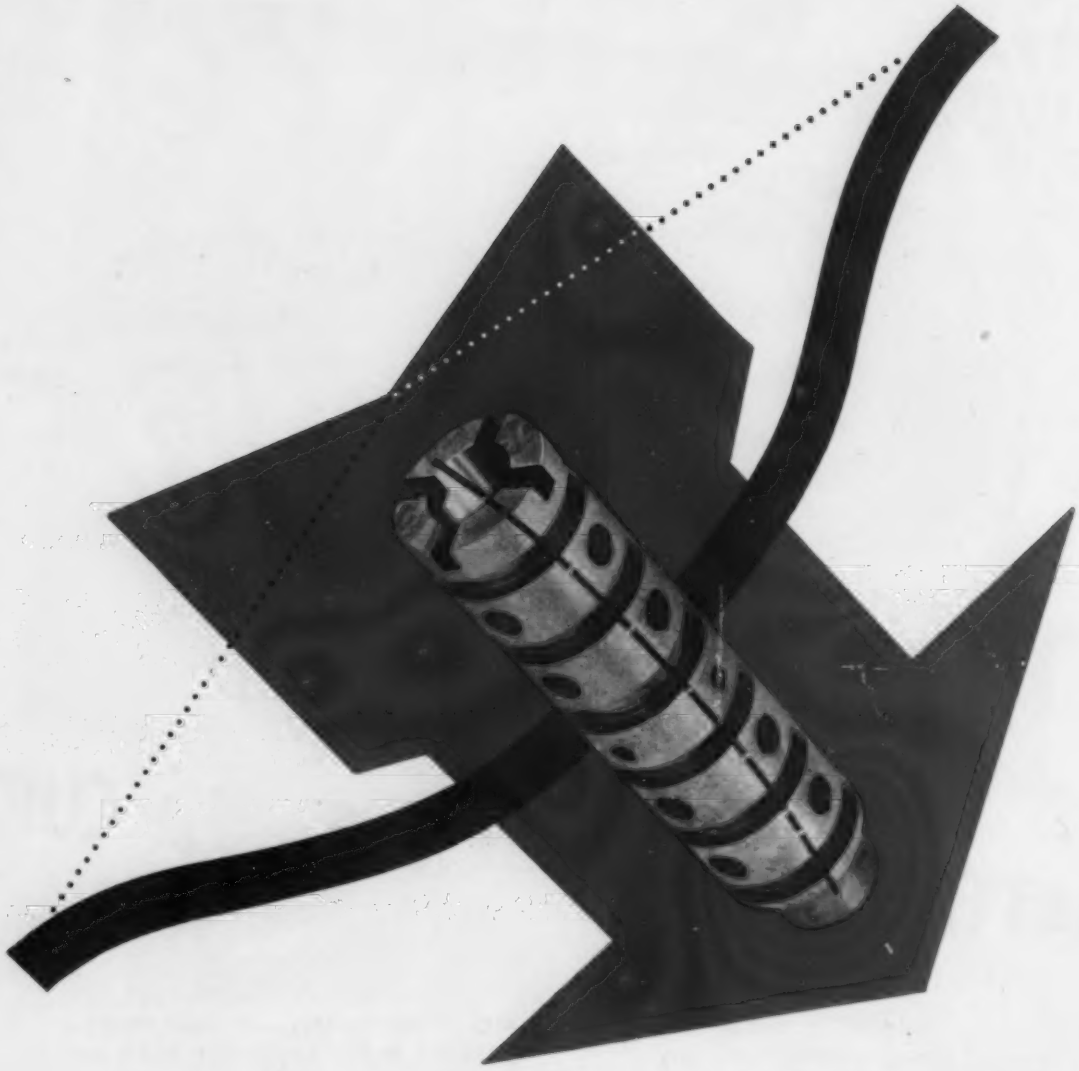

honing corrects bowed holes to arrow-straightness

Sunnen Honing Tools are engineered to cut *only* where the surface of a hole varies from its true axis. They correct bow, barrel, hour-glass, taper, or bell-mouth with minimum stock removal. Results are arrow straight holes... increased production and lowest cost per hole. A Sunnen installation gives you the ultimate in precision at low original cost (under $1,000 in most cases). Operating costs are lowest, too... standard tooling handles most jobs within the diameter range of .120" to 2.625".

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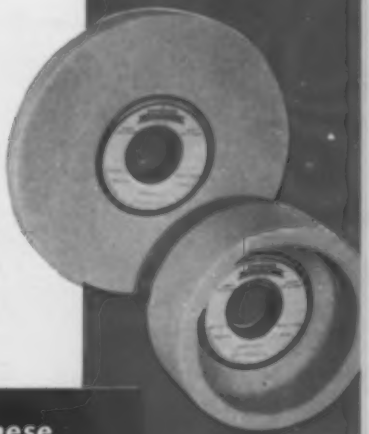
NEW DA Borolon® TRADE MARK ... abrasive for resinoid bonded snagging wheels

New DA Borolon . . . an improved, smaller crystal aluminum oxide abrasive for resinoid snagging wheels for floor stand and swing frame grinders . . . has more and sharper cutting edges, gives more production. Use with IL Bond described above.



NEW SA Borolon® TRADE MARK ... abrasive for toolroom grinding wheels

New SA Borolon . . . a radically different, friable aluminum oxide abrasive with a unique *single* crystal formation that gives cooler, faster grinding and longer life. Ideal for tool and cutter grinding and horizontal surface grinding.

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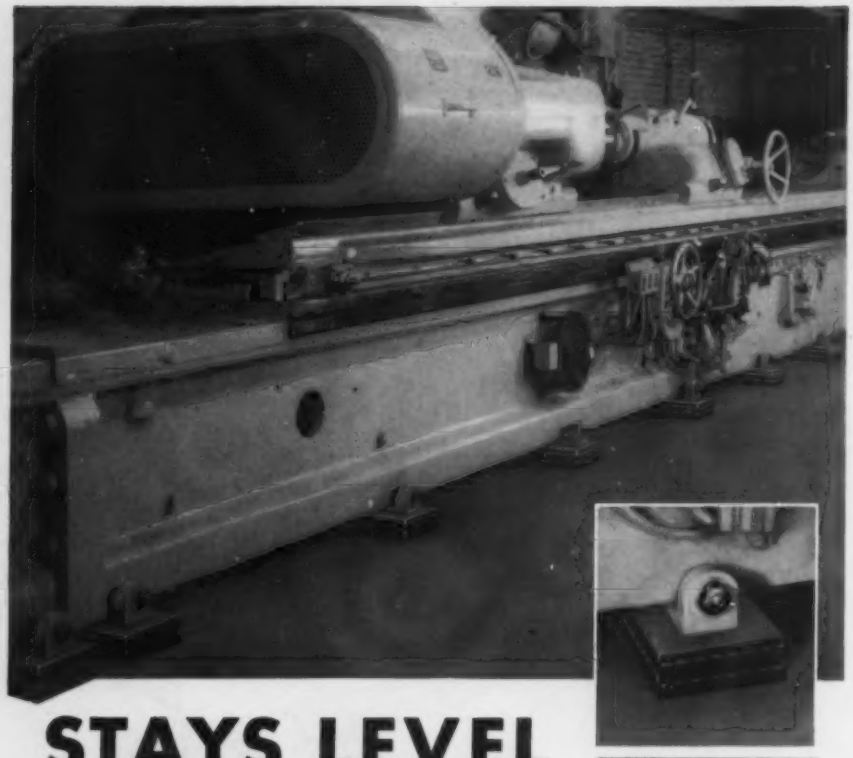

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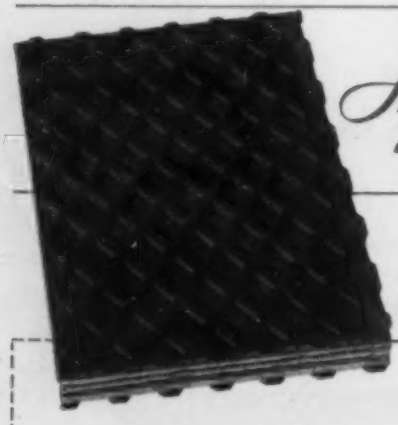

Air-Loc® 4·17·4

You get a permanent precision installation with patented AIR-LOC mounts that *Resist* oil, water and alkali, *Permit* easy leveling, *Eliminate* need for bolts or cement, *Hold* machines in place, *Reduce* transmitted vibration from the floor.

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Letters . . .

editorial in the April 1957 issue of Grinding and Finishing are indeed challenging to all of us. We know that our path will not always be an easy one and our progress will be slow, but we intend to follow our purposes and build, to the best of our ability, a technical society which will be beneficial to both manufacturers and consumers of abrasives and allied products.

We look forward to years of service to our members and friends.

J. Y. Arnold
President
American Society for Abrasives

Your account of the American Society for Abrasives failed to give the address of the organization. Several members of our engineering staff are interested in joining, because we feel that we will learn a great deal from activity in such a society. Will you tell us how we may get in touch with the group?

Arthur G. Bradley
New York

For information on the American Society for Abrasives, write to Jan L. Deelman, Secretary, American Society for Abrasives, 222 Berks County Trust Bldg., Reading, Penn.

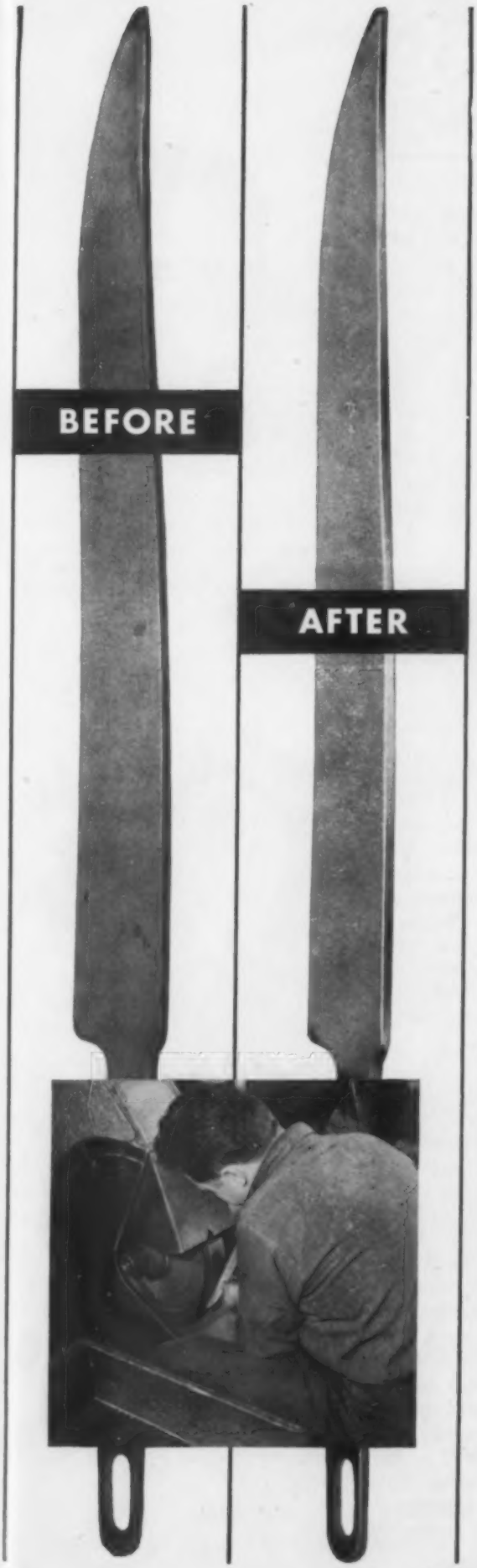
Reclaiming Grinding Segments

I was very much interested in your article in GRINDING AND FINISHING magazine on reclaiming grinding segments. (G & F, May 1957, p. 50) We feel sure there are tremendous savings for us in this process.

Would you kindly forward information concerning the availability of Gaff Bond 344 bonding material and hardener. This information was conspicuous by its absence in your otherwise informative article.

J. J. Zwack
Director of Quality Control
Dubuque Stamping & Mfg. Co.

Gaff Bond 344 and the hardening agent with which it is used are products of Chemical Development Corp., Danvers, Mass., phone SPring 4-1990.



HOW WOULD YOU SOLVE IT?

1. PRODUCTION PROBLEM: To cut grinding time on the backside of forged steel carving knives before plating. H. Boker Company was using grinding wheels and setup wheels in a two-step operation that was slow and left an unsatisfactory pre-plating finish.

2. SOLUTION: A 3M Representative suggested that this Maplewood, N. J. firm switch to the 3M Backstand Method using Grit #150 Three-M-ite Resinite Cloth Belts. Results: knife blades are now ground in *one* operation with consistently superior finishes for plating.

3M Abrasive Belts can help you cut costs and increase production of cutlery, hand tools or hardware products, too. Call your 3M Representative today for full facts, or send coupon below.

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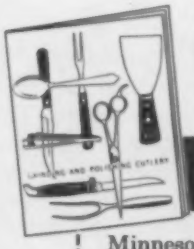

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Industry Observer

Use of gage blocks has increased more than 400 per cent in the last five years, according to E. Ellstrom, president of Dearborn Gage Co. This has resulted from constant growth in number and range of on-the-job measurement problems throughout industry. Use of blocks has spread to many "working" operations in the shop, he said. Keys to wider use: close, dependable accuracy; versatility of application; simplicity of gage block principle of measurement.

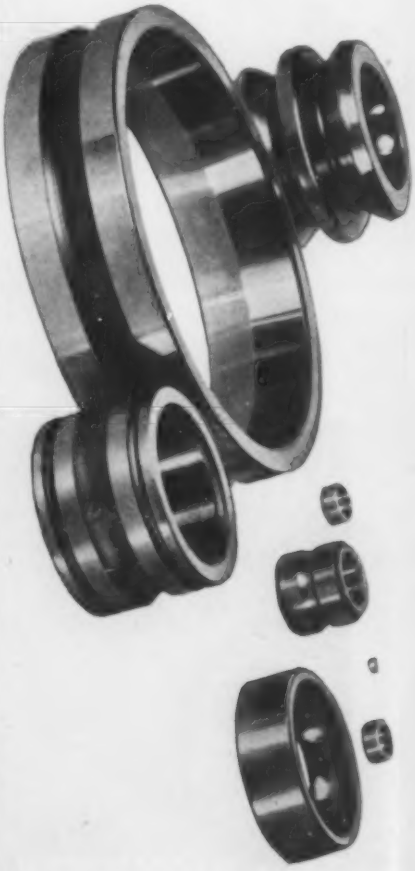
Supporting Ellstrom's claims is announcement by both Sheffield and DoAll of programs of instruction in using and checking gage blocks within individual metalworking plants. DoAll labels theirs "How to Be Your Own Bureau of Standards", gives a four-day "crash program" of instruction in their plant to quality control personnel in metalworking industries. Students learn how to inspect and calibrate blocks, learn effects of surface finish and wear. Sheffield has described good typical program for planning and operating an in-plant gage laboratory in a new booklet just released.

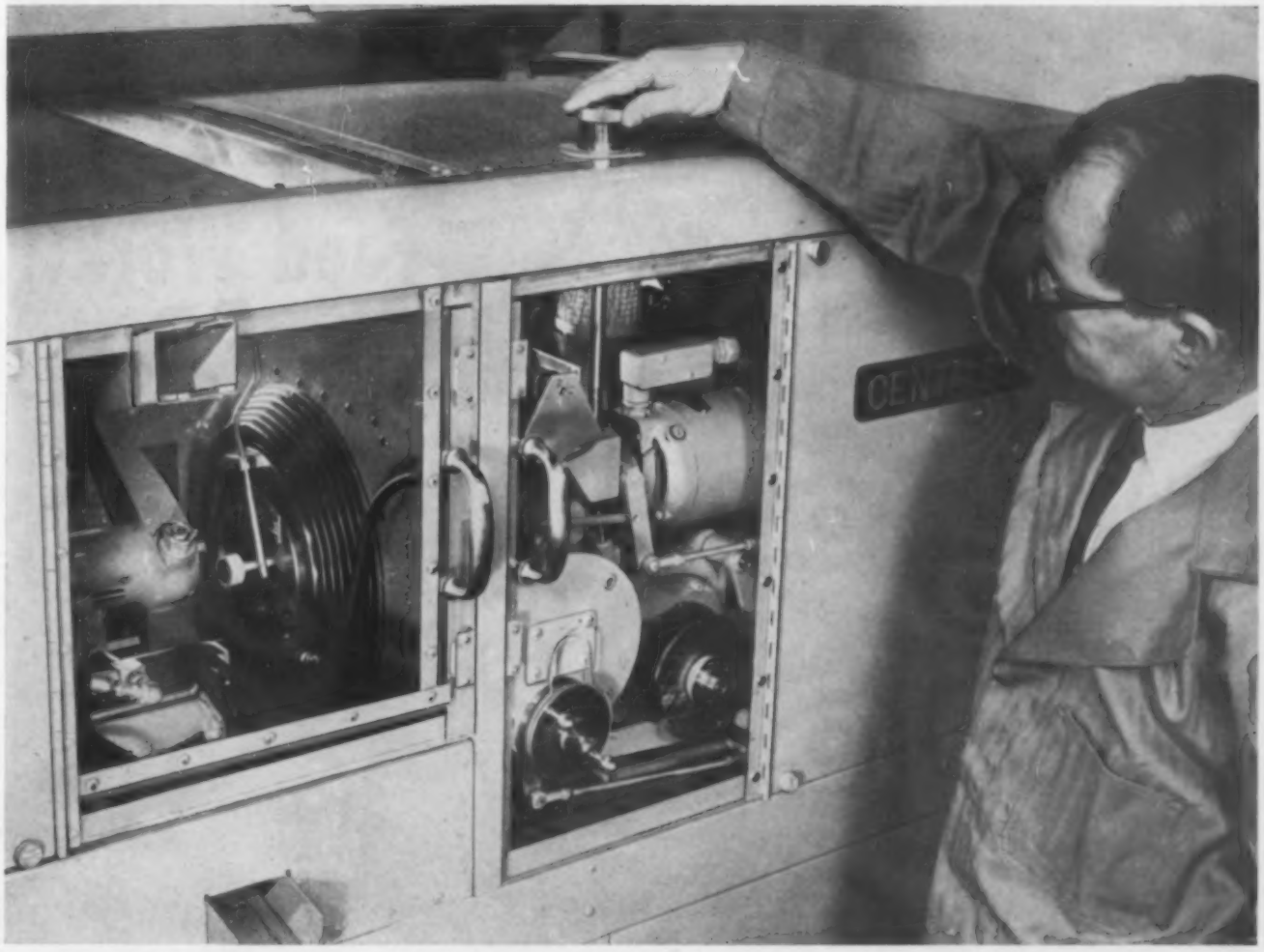
The shortage of technical personnel is probably nowhere being as keenly felt as in engineering education positions. The latest full-scale attack on the technical teacher shortage is being made by The American Society for Engineering Education by means of a $10,000 grant from the National Science Foundation. Money will be used for preliminary work on a study "to determine and describe in detail the character and magnitude of the manpower and related financial needs of engineering colleges" and for organizing a full scale attack on the problem. This seems to us a realistic approach—to properly define the needs in

(*Continued page* 18)

Meet J. K. AIKEN

... one of Bryant's experts on internal grinding of all types. "Ken", who has been with Bryant for 27 years, covers the New England territory.





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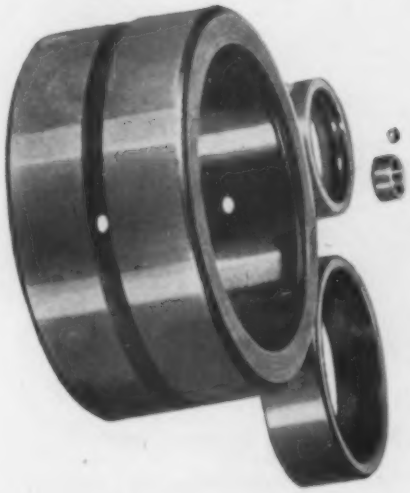

The Bryant "Centalign" proves, over and over again, that you can cut internal grinding time up to 50%.

The "Centalign" is a *production-proven* internal grinding machine, capable of grinding straight bores, tapers and raceways in precision bearings with incredible speed and constant accuracy.

The "Centalign", by means of its completely new construction principles, dramatically outperforms any and all other comparable equipment on the market. The production gains and cost savings it has given bearing manufacturers throughout the world are so substantial, that no bearing manufacturer can afford *not* to investigate.

Ask for an immediate demonstration!

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Capacity: 0" to 4¼"
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MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

...Form Grinding...Profile Work...

with ONE

VAN NORMAN 2C
Centerless Grinder

Featuring a 15 HP main drive motor which provides ample power for every grinding job, the Van Norman 2C Centerless Grinder actually gives you the facilities of *3* centerless grinders . . . standard grinding for thru-feed work . . . standard grinding for in-feed jobs and, equipped with crush dressing attachment, form grinding and profile work.

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Check these features of the Van Norman 2C Centerless Grinder:

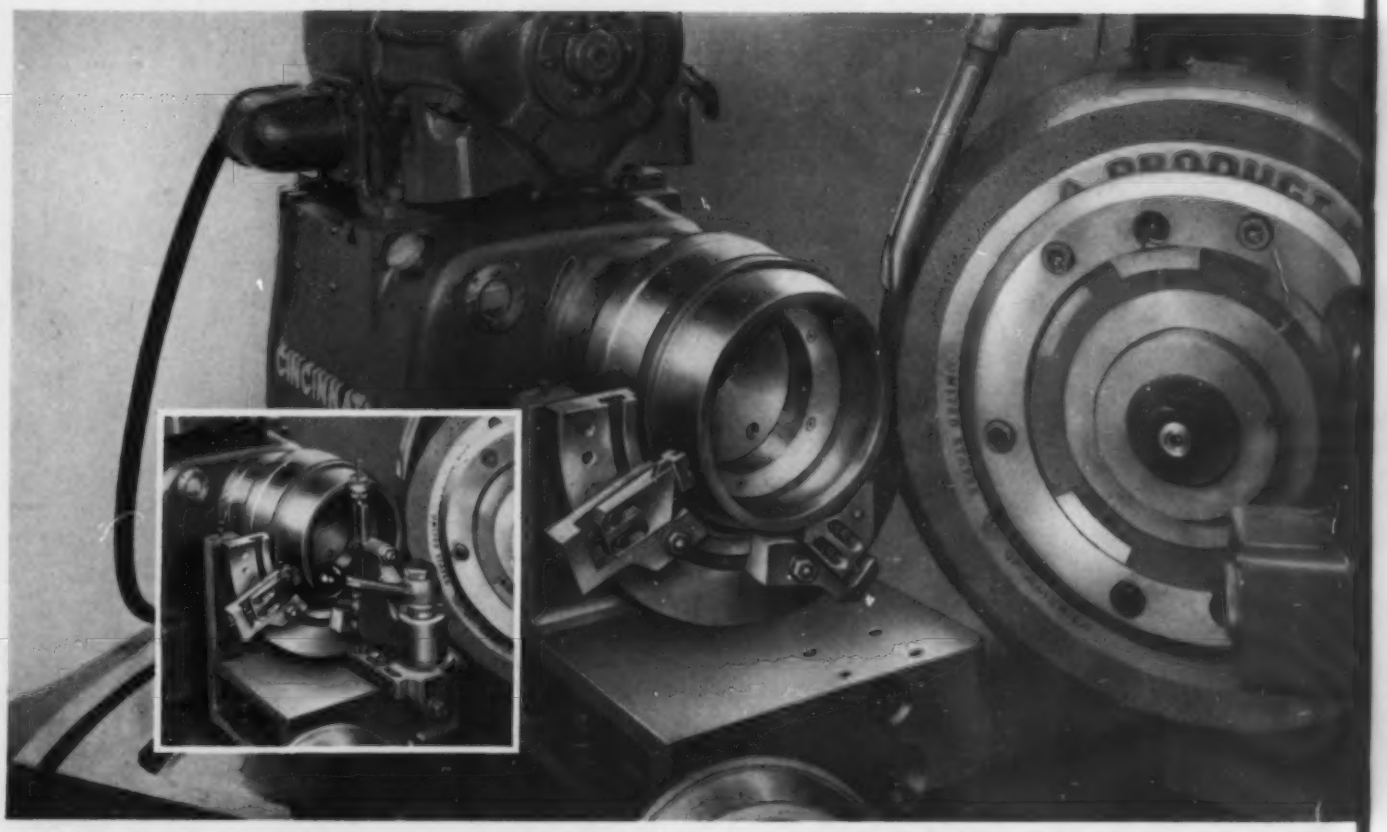
- √ Hard chrome plating of regulating wheel slide preserves original factory built-in accuracy.
- √ Grinding wheel and regulating wheel spindles are of a unit type construction . . . totally enclosed with double-row super-precision bearings, sealed and lubricated for life — assuring rigidity and accuracy previously unobtainable in centerless grinding, vibrationless operation.
- √ Spindles require no warm-up period, eliminating "creep."
- √ Infinitely variable regulating wheel drive.
- √ Combination straight and profile hydraulic wheel dressers for each wheel.
- √ **Crush dressing attachment**

COMPANY
SPRINGFIELD 7, MASSACHUSETTS

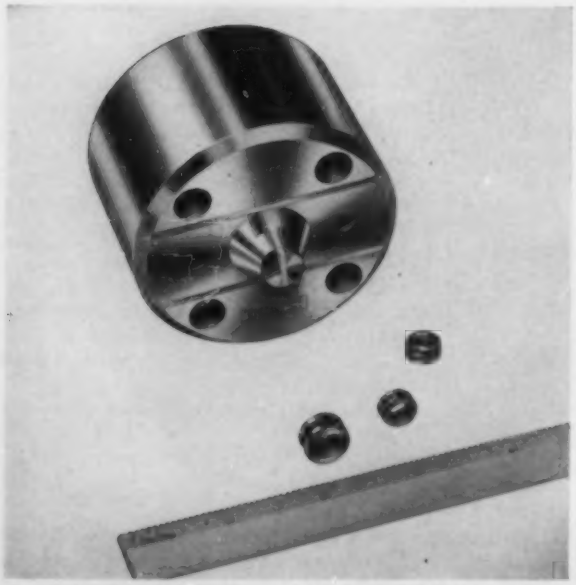
Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . up to 10 years.

Use postpaid card. Circle No. 211

New Tricks for Machining with



Taft-Peirce Magnetic Work Drivers



Two-pole Taft-Peirce Permanent Magnet Work Driver. Magnetically holds ball bearing inner races during grinding of external ball grooves. Parts are shown in front of work driver.

This Latest Application of Magnetic Forces by Taft-Peirce provides a Real Tooling Setup at great savings!

Here's a complete tooling setup for minimum cost! Magnetic Work Drivers eliminate awkward tailstock arrangement, cost substantially less than complicated holding devices. Little or no maintenance is required, there's nothing to go wrong. Developed primarily for shoe type centerless grinding of ball bearing, inner and outer races, the T-P Work Driver can hold a variety of sizes and shapes, including tapered OD for governing valve plugs and OD and ID of valve ports. Work Drivers can be designed to handle work from ½" ID and larger. Furnished in either permanent magnet or in electromagnetic models, Work Drivers are specially designed and built for each application.

The Taft-Peirce Family

AIR GAGES • LAPPING MACHINES • PRECISION GAGES
TOOL-ROOM SPECIALTIES • MAGNETIC CHUCKS • GRINDING MACHINES

Magnetic Work Drivers and Chucks

Superpower Rotary Electromagnetic Chucks

Taft-Peirce packs maximum holding power in a small space so that simplified, low-cost setups can be used on rotating spindles. This small Rotary Chuck is grinding close to a shoulder, without complicated fixtures. There are ten standard sizes with diameters from 5⅛″ to 30½″, to give the most effective holding power for the work being done. Special faceplates can also be designed.

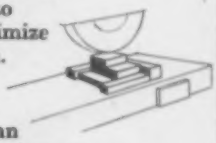
Superpower Specials Do Wide Variety of Work

The speed and simplicity of magnetic chuck-held machining is providing lower-cost production on an ever greater range of work. The special 55½″ x 40″ Superpower Chuck at right was built to hold cast iron loom-sides on a 75 hp milling machine. Three 18″ carbide cutters and two 4″ mills take ¼″ cuts simultaneously at 30″ per minute. Taft-Peirce Chucks have been built to handle light planing and milling and special shapes, including holding propeller blades for shaping and contour grinding. If there is any possibility magnetic chucks can help your production, give the problem to Taft-Peirce for further study.

Tips

and IDEAS on MAGNETIC CHUCKING

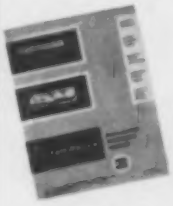
Permanent Magnetic Chucks should always be faced with the pack (handle) moved to the "off" position. This assures minimum deflection of the faceplate. Electromagnetic Chucks should be turned "on" and allowed to "warm-up" to minimize faceplate distortion.



Magnetic chucks can be used to hold non-ferrous materials by "backing-up" or surrounding the workpiece with bars or pieces of steel.

Irregular shaped parts can be easily ground using the "mold" technique. Invert part, surround with a mold of lead, babbit or sulphur incorporating steel slugs near the top of the mold. Then, turn right side up, place on chuck and grind.

Get the Taft-Peirce Catalog on Chucks



Catalog No. 412 presents technical data, design details, suggestions and prices on the complete Taft-Peirce line. Find out what magnetic chucking can do for *your* production by writing: The Taft-Peirce Manufacturing Co., Woonsocket, Rhode Island.

T P

TAKE IT TO TAFT-PEIRCE

THE TAFT-PEIRCE MANUFACTURING CO.
WOONSOCKET, R. I.

T-P Means TOP Precision

Here's a simple, economical way to turn water into an *all-around* superior grinding solution for ferrous metals and titanium! For ferrous metals, just mix 1 part W&B Grinding Concentrate 1500 with 150 parts of water. You'll get a low-cost, transparent mix that really keeps wheels open . . . settles chips instantly. Provides excellent rust protection and freedom from foam too. Grinding is keener . . . machines stay cleaner. Get complete information on this outstanding grinding concentrate. Fill out and return attached coupon.

W&B Grinding Concentrate 1500 is being used by many of the country's largest manufacturers.

W+B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.

Worcester, Massachusetts • Detroit, Michigan

Originators of Grinding Lubricants

THE WHITE & BAGLEY CO., 88 Foster St., Worcester, Mass.

Please send me complete information on W&B Grinding Concentrate 1500 — and the list of large users.

Name ..... **Title** .....

Company ..... **Street** .....

City ..... **Zone** ..... **State** .....

☐ My plant has a tricky grinding problem on which we'd like advice. I've attached a letter describing it in detail. I understand that you offer this service without obligation.

Use postpaid card. Circle No. 213

Observer . . .

technical education, as emphasized in last month's review of Dean Carson's speech on the manpower shortage (GRINDING AND FINISHING, May '57, p. 55).

5.75 Million operating businesses can be expected in the U.S. by 1975, according to a Dun & Bradstreet report. Three rates of growth —estimates of the total number of U.S. businesses, population censuses, and the D & B Reference Book—have been correlated to give the projected figure for 20 years hence. On the average, the report states, our economy needs one business concern for approximately every 40 people.

A proposed revision for the trade practice rules governing the Buff and Polishing Wheel Industry is in the works, affecting manufacturing and sale of buffs. The Federal Trade Commission, in making public the nature of the proposed rulings for the industry, detailed the advertising, pricing and sales practices involved.

Five times as many executives expect an upturn in business in 1957's third quarter as expect a drop, according to a Dun & Bradstreet survey. This is still optimism of a solid nature, though a survey three months ago showed the "ups" outnumbering the "downs" by twelve to one. Maintenance of high employment levels was expected by a vast majority of executives surveyed.

"Naturally, with a problem of this magnitude, I thought of you immediately."

Metal removal *faster* at lower cost

CHICAGO MOUNTED WHEELS

Prompt Out-of-Stock Deliveries

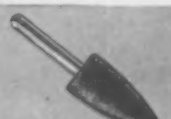
There is a precision-engineered Chicago Mounted Wheel or point for every imaginable grinding operation. Ideal for efficient, effective deburring. . . . Always available . . . in all standard sizes, and over 200 special shapes, for out-of-stock delivery. Save Time – Money – Materials . . . Specify Chicago Mounted Wheels!

Every Chicago Mounted Wheel is produced under positive production control . . . assuring perfect uniformity of mounted wheels and points. There is no variation from one production run to another.

Positive density control for peak job performance

Guaranteed to stay on the mandrel . . . perfectly balanced

Chicago Mounted Wheels are easily dressed and hold their shape



Unlimited number of combinations of dimension, shape, grain, size and bond

WRITE FOR *Trial* CHICAGO WHEELS

Test them yourself!

Send coupon for two Chicago Mounted Wheels . . . Test one against the other . . . you'll see the meaning of true uniform performance!

CHICAGO WHEEL & MFG. CO.
1101 W. Monroe Street • Chicago, Illinois

Send me two sample Chicago Mounted Wheels without charge:

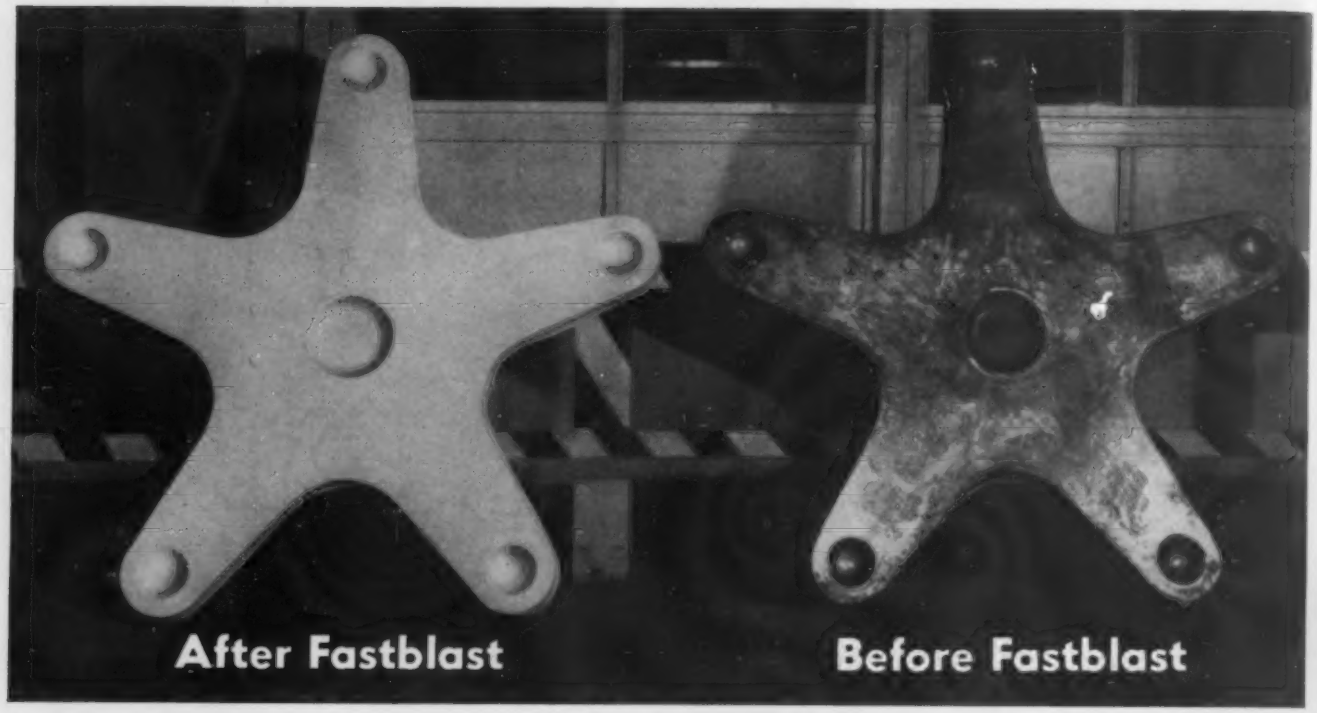
Name_____

Address_____

City_____ Zone____ State_____

Use postpaid card. Circle No. 214

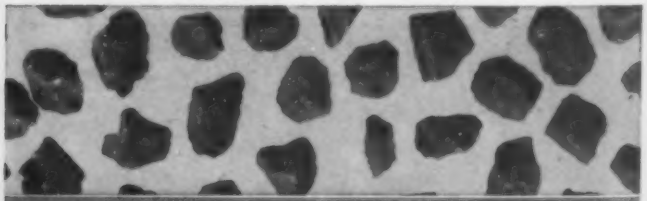
Clean Forgings Fast with Exolon Fastblast



Wyman-Gordon Company cleans these Helicopter Hub Rotor Magnesium Forgings by pressure blasting with Fastblast

Above: Hub Rotor forgings were produced on this 50,000 ton hydraulic forging press at North Grafton, Mass. plant of Wyman-Gordon — U.S.A.F. It is 10 stories high, 48 feet above and more than 60 feet below the floor.

These large helicopter hubs come out of the forging dies covered with grease and graphite. Air pressure blasting with EXOLON Fastblast, a 100% new aluminum oxide abrasive, quickly cleans them. Fastblast grains are strong, sharp and clean . . . free from weak particles and "lazy" fines and splinters. It's a tough abrasive, that breaks down slowly so that its reclaim value is high. Fastblast can be used over and over again. Fastblast saves time and money. Write for complete information.



Above: Photomicrograph of Fastblast. Shows tough, hard grains that cut faster and last longer.

The EXOLON Company

1002 East Niagara Street • Tonawanda, N. Y.

Manufacturers of SILICON CARBIDE and ALUMINUM OXIDE ABRASIVES

Use postpaid card. Circle No. 215

BARNESDRIL

special honing tool

answers unique finishing problem

- **removes taper**
- **corrects out-of-roundness**
- **applies selected finish**

production:
232 brake drums per hour, holding 80 to 100 RMS finish.

BarnesdriL Special Blind-End Honing Tool with Adjusting Head utilizing Plas-T-Clad stones.

For the first time it is possible to remove taper, correct out-of-roundness and apply a honed finish, all in one operation. The honing tool that does all these things has been developed by BarnesdriL engineers, specifically for a brake drum manufacturer.

The drums represent a blind end bore of 11" in diameter and 2¼" deep. In order to reproduce the specified requirements, BarnesdriL engineers designed a special honing tool, Model HFB-8. This tool is a Special Blind End Lever type honing tool, utilizing eight clamp-type stones. The tool removes .003" to .005" stock from the sides of the brake drum. The finish is held between 80 and 100 RMS and the bore is honed diametrically straight.

Two of these tools are mounted on a 2-Spindle Ram Type Machine that provides a positive stop and dwell for blind end honing. Final production is 232 drums per hour.

custom-honing service for special short-run applications.

Send us your short-run pieces, with specs and finish requirements for prompt honing by expert technicians.

50th year

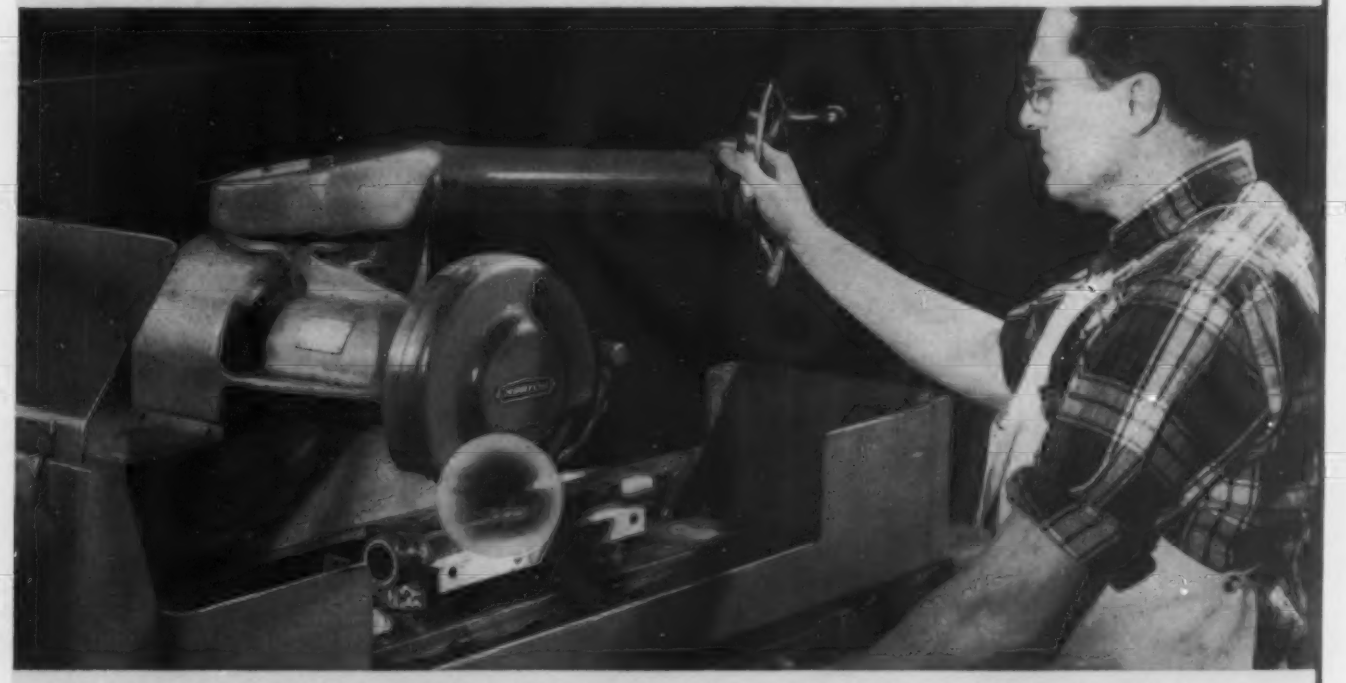
BARNES DRILL CO.

886 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 3419 South Telegraph Road

Use postpaid card. Circle No. A1

With your surface grinders

ON BIG SURFACE GRINDERS, like Blanchards, Hanchetts, Mattisons, Thompsons and Hills, G BOND-32 ALUNDUM wheels bring you many "Touch of Gold" advantages. Such as cooler, faster cutting action . . . heavier cuts without burning . . . closer tolerances and smoother finishes . . . less dressing and more pieces per dressing . . . more work, and more kinds of work, per wheel.



ON SMALL SURFACE GRINDERS, including toolroom machines, G BOND-32 ALUNDUM wheels give you the same value-adding, cost-cutting benefits. They're ideal on grinding machines like Brown and Sharpes, Crystal Lakes, Deltas, Doalls, Gallmeyer and Livingstons, LaSalles, Reids, Sanfords, Taft-Peirces, Nortons and many others.

. . . TAKE DEEP COST CUTS

Norton G BOND-32 ALUNDUM wheels add the profit-boosting "TOUCH of GOLD" to any size machine*

W-1789

The Norton G Bond is the most efficient ever developed for precision and semi-precision grinding. It holds each abrasive grain just long enough for maximum cutting action, assuring a constant grinding surface of fresh, sharp cutting edges.

Norton 32 ALUNDUM abrasive is another big advancement in grinding progress — ideal for surface grinding requiring fast stock removal and heavy feeds.

Remember: only Norton offers you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost. See your Norton Distributor for further facts on how the G Bond and 32 ALUNDUM abrasive combine to form the best "Touch of Gold" team for grinding high speed and alloy steels. (For other applications investigate other Norton ALUNDUM and CRYSTOLON* abrasives.) Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

NORTON

ABRASIVES

Making better products...
to make your products better

NORTON PRODUCTS:
Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING DIVISION:
Coated Abrasives • Sharpening Stones • Behr-cat Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

Use postpaid card. Circle No. A2

PERFORMANCE REPORT:

Blanchard No. 18 surface grinders have a long history of outstanding performance. They're economical, extremely accurate and highly productive on a wide variety of jobs.

V-490

STANDARD STEEL WORKS DIVISION
BALDWIN-LIMA-HAMILTON CORPORATION
BURNHAM, MIFFLIN COUNTY, PA.

November 26, 1956

Machinery Associates, Inc.
325 E. Lancaster Avenue
Wynnewood, Pa.

Attention: Mr. C. Duncan Day, Vice President

OUR PURCHASE ORDER 8781-4576
YOUR ORDER M2-1-809

Gentlemen:

In response to your letter of October 12, 1956 relative to the No. 18 Blanchard High Power Vertical Surface Grinder which you furnished to us on the above order, I wish to advise that this machine has been entirely satisfactory. The machine was purchased primarily for grinding form and hollow bore cutters for our machine shops and the machine was installed in our Small Tool Department. We estimate that the savings which we have already experienced will allow us to amortize the machine in a period of approximately one year. Since the work load on cutters alone kept the machine busy only approximately one-third of the time, we have been able to do additional grinding which was formerly done on other machines and have been able to realize the same economies as we did on the grinding of the cutters.

Yours very truly,

W. E. Shissler, Jr.
Chief Engineer

PUT IT ON THE BLANCHARD

Send today for your free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding", third edition.

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

Use postpaid card. Circle No. A3

BESLY **Grinderscope**

NEWS AND VIEWS ABOUT WAYS TO CUT COSTS WITH MACHINES AND METHODS
FROM BESLY-WELLES CORPORATION, SO. BELOIT, ILLINOIS

Feeding radial refractory tile into the Besly 630-26" Grinder. Tile are placed on the chain conveyor which carries them through the grinding zone.

Removing tile after grinding. Note chain conveyor feed mechanism.

A. P. Green Fire Brick Company

Parallel Grinds Radial Tile - In One Pass

on a Besly 630–26" Grinder

THE A. P. Green Fire Brick Company, Mexico, Missouri makes radial refractory tile for use in furnace linings and many other industrial purposes. Pieced together properly they make snug fitting, circular forms often practical for use without adhesive agent. Should the tile be "off angle" or improperly "sized" during manufacture the curvature of the circular shape is thrown out of alignment permitting heat (in the case of furnaces) to escape. Other uses with adhesive are also imperiled when pieces are too irregular.

Another factor which makes production difficult for the A. P. Green Fire Brick Company is that during the firing of this tile the radial lines are changed slightly due to shrinkage. They learned early to fire to strict specifications, then grind to precision tolerances. With an existing one-wheel grinder, tile were passed over the abrasive, one by one, one side at a time. This method slowed down production and often did not achieve the precision products desired. Faced with a big demand for radial tile, the company sought a speedier, more efficient grinding system.

Since it was felt that a specially designed grinder was needed, they called on Besly-Welles Corporation for consultation. Working directly with the A. P. Green Company men, Besly engineers designed the Besly 630-26" grinder for the job.

This Besly No. 630-26" Double Horizontal Spindle Disc Grinder is made with two separately powered and driven spindle mechanisms each with an abrasive disc in opposed position. Space between discs is adjustable to fit work pieces and to compensate for wheel wear. The heads and

BESLY Grinderscope

News and Views About Ways to Cut Costs with Machines and Methods from Besly-Welles Corporation, So. Beloit, Illinois.

Tile are ground to within .031" for size on both sides simultaneously.

Stacks of arched tile ready for shipment. These also are ground on the Besly 630-26" Grinder.

spindle motor assemblies are adjustable to grind different angular requirements up to 30°. Straight sided brick from 2½" to 16" wide and up to 20" long and angled brick from 4⅜" to 16" wide and up to 20" long can be ground on this machine. With a built-in wheel dressing component, this grinder is especially useful for handling such items as fire brick, tile, building blocks, cylinder heads, bath tubs and others where extremely close tolerances for size, flatness and parallelism are not needed. Requiring only 12' x 13' of floor space, the Besly 630 Grinder can be adapted to handle 26", 30" and 42" size abrasive discs. Two types of Besly-Titan 26" abrasive discs are used for grinding the radial tile at the Green Company. Designed for heavy duty grinding, these discs give remarkably long service before replacement is required.

In operation, radial tile are wheeled to the grinding machine. One man places them on a chain conveyor feed mechanism, where they are driven by lugs carried by the chain. The tile passes automatically between the abrasive wheels of the machine, dry grinding both sides simultaneously to a tolerance of .031" for size. .062" of stock is ground off in one pass. Another man removes tile which then goes on to the shipping docks.

In addition to handling these pieces, this Besly machine can also be easily adapted to grind special arched shapes, a fact which increases the usefulness of this grinder for the A. P. Green Fire Brick Company. Since the machine was installed, the productive capacity of the company has been increased. Precision-made products to fill the demands of customers are more readily assured.

Besly offers more than 82 years of disc grinding experience to help solve your grinding problems. If you would like to know how to cut costs and increase production, Besly Engineers will be most happy to show you how to achieve worthwhile results. A bulletin describing the complete line of Besly Grinders is available on request.

SEND COUPON FOR BULLETIN NO. 200

BESLY Grinderscope

News and Views About Ways to Cut Costs with Machines and Methods from Besly-Welles Corporation, So. Beloit, Illinois

New TYPE A "WISE" (PATENTED)

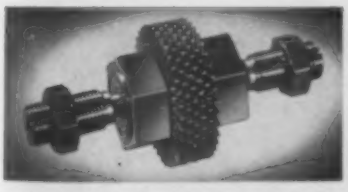
DRESSER CUTTER ASSEMBLY

IDEAL for dressing hard abrasive discs

- LASTS LONGER
- LOW UNIT COST
- SQUARE ARBOR FOR LONGER SPINDLE LIFE
- ADAPTABLE TO ALL GRINDERS USING 2½" DIAMETER CUTTERS
- INTERCHANGEABLE PARTS

Combines fine and broad teeth for perfect dressing performance and the longer service life needed for hard abrasive dressing.

Fine teeth pick grain from the surface producing a cutting action that sharpens without changing grinding characteristics. Broad teeth prolong the life of the cutters. Sealed ball bearings provide frictionless rotation. Built-in buttons eliminate spacer washers and interlock complete assembly assuring accurate tooth spacing. Six cutter blades to the set, come taped ready to assemble. Interchangeable with standard "Wise Type" Dresser Cutter Assembly.



STANDARD Besly "WISE TYPE" Patented DRESSER CUTTER ASSEMBLY is particularly suitable for softer disc dressing. All fine teeth. Has all the features of and is interchangeable with the new Type A.

Send coupon for trial and prices.

Give Freer Cutting — Plus Long Life and Low-Cost Grinding

THIS TYPE OF DISC IS USED BY THE A. P. GREEN FIRE BRICK COMPANY AS DETAILED IN THE PRECEDING PAGES.

These Besly-Titan Abrasive Discs are made either plain or perforated. In the perforated type, the size of the perforations can be varied or actually omitted in part of the disc, depending upon the particular grinding job to be done. The cutting and lasting qualities of the discs are improved by the addition of a special material which is dissipated in the baking, leaving voids or clearance areas. This is the "open structure" feature of the Besly-Titan Abrasive Discs and can be combined into the plain or the perforated styles. It is the type of disc which has given the A. P. Green Fire Brick Company such satisfactory results in their work.

Besly-Titan Abrasive Discs and Wheels are always made to order for your specific requirements. It costs no more to get these "custom" abrasives than for "stock" types. We make the formula to give you the best possible results. Ask our Abrasives Engineer to show you how to increase your grinding performance and reduce your costs.

NEW BOOKLET . . .

contains the facts about Abrasive Discs and Wheels. Get your free copy, now! Send coupon below.

BESLY TITAN

ABRASIVES

SOLID DISCS • PERFORATED DISCS
CYLINDERS • WHEELS

Products of

BESLY-WELLES CORPORATION

Est. as C. H. Besly & Co., 1875

20 N. WACKER DRIVE
CHICAGO 6, ILLINOIS

Use postpaid card. Circle No. 216

BESLY-WELLES CORPORATION
185 Dearborn Avenue
South Beloit, Illinois

Please send the following, free

- ☐ New Abrasives Booklet
- ☐ Bulletin No. 200 on Besly Double Horizontal Spindle Disc Grinders
- ☐ Trial and prices on Besly Dresser Cutter Assemblies

Name .....

Company .....

Street .....

City ..... Zone ..... State .....

Bay State mounted wheels are used by Lycoming craftsman, Fred McCall, on hardened steel drive component to "break" sharp edges which might cause points of weakness.

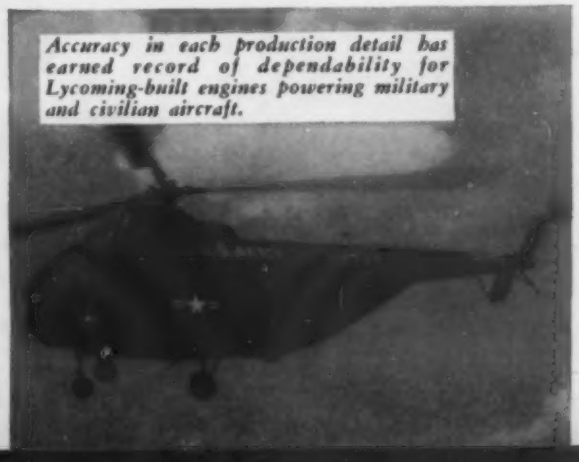
Grinding at Lycoming Needs Wide Range of Wheels — Versatile Engineering

TO the Lycoming Division of Avco Manufacturing Corporation at Stratford, Connecticut, *dependability* in aircraft engines is as important a product as the engines themselves! And precision grinding, in many forms, helps produce this built-in dependability.

For example skilled deburring of the accessory drive gear component shown on this page is important because sharp edges could set up points of weakness . . . and human life will be at stake.

On these carburized steel parts with surface hardness to 65 Rockwell C, a small spherical wheel of exceptional durability is needed to do the job neatly and precisely. A wheel too soft grooves quickly and leaves a ragged edge, needing another operation to finish it. Bay State specified, and manufactures for this job, a wheel that skillfully combines the necessary hardness with a clean cutting action which leaves no surface burn — also important because all parts must pass 100% acid-etch inspection.

Specifying and faithfully reproducing these efficient small wheels is one important Bay State contribution to the dependability of Lycoming-built engines.



Accuracy in each production detail has earned record of dependability for Lycoming-built engines powering military and civilian aircraft.

Precision ground parts must meet the most rigid Lycoming standards of surface finish as well as dimensional accuracy.

Giants like this 42" Bay State wheel mounted in special machines grind 3 O.D. dimensions and 2 faces on engine crankpins.

Bay State Abrasive Engineer, Hugh Reynolds, serves Lycoming as both supplier and consultant in many phases of production grinding. His special skills and dependable products are valuable assets to this leading manufacturer.

In the larger grinding wheel sizes, too, Lycoming depends on Bay State for many critical operations. The multi-purpose cylindrical grinding set-up illustrated above is a typical case.

This special Landis grinder mounts a mammoth wheel, 42" x 6" x 12", specified by Bay State to perform a series of precision grinding operations on engine crank-pins. Three different O.D.'s and two faces are ground on this critical component, removing from .015 to .050 stock. The part made of AMS-6415 nitriding steel is finish ground in the soft state at about 35 Rockwell C. The successful Bay State specification was selected for its ability to produce fine, uniform finish, yet hold its corners for long productive periods between dressings.

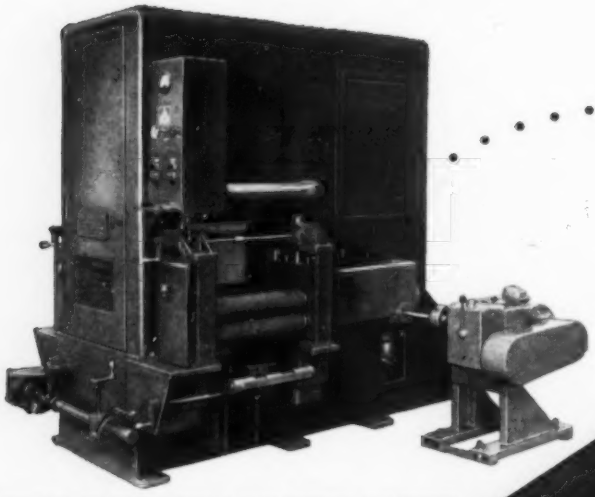
At Lycoming and other plants, Bay State engineers are solving grinding problems . . . applying grinding wheels from the smallest to the largest . . . specifying grinding wheels for every purpose, every type of machine. With confidence, call in Bay State through any of its branch offices or distributors.

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Mass., U. S. A.
Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh.
Distributors — All principal cities • In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

BAY STATE
WHEELS of PROGRESS

Use postpaid card. Circle No. 217



ABRASIVE BELT GRINDING & POLISHING MACHINE
(Pinch Roll Type)

For pre-finishing, conditioning and polishing sheets, plates, strips or blanked-out shapes in flat form. Used as single units or in multiple units for progressive line polishing.

for FINISHES that pass inspection the FIRST TIME get a HILL Grinding & Polishing Machine

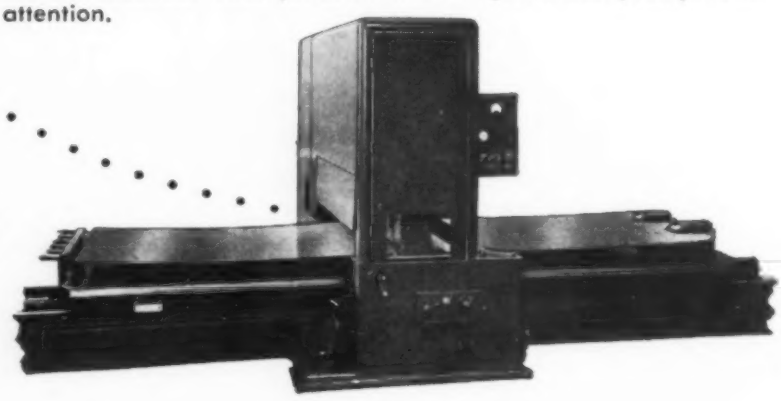
The basic HILL two-roll vertical head with endless abrasive belt. Used in both the Pinch-Roll and the Hydraulic Table types.

● HILL 2-ROLL Vertical Abrasive Belt Grinding and Polishing Machines are made in two general types for producing superior finishes on flat surfaces as required by manufacturers of a wide variety of products such as decorative plastics, auto bumpers, engravers plates, home appliances, etc.

Both types are built in polishing widths up to 60" and larger sizes can be furnished if desired. Your problem will be given our prompt and careful attention.

ABRASIVE BELT POLISHING MACHINE
(Hydraulic Table Type)

For flat polishing of sheets and plates of ferrous and non-ferrous metals. Made in a variety of table widths and lengths with full hydraulic reciprocating table.



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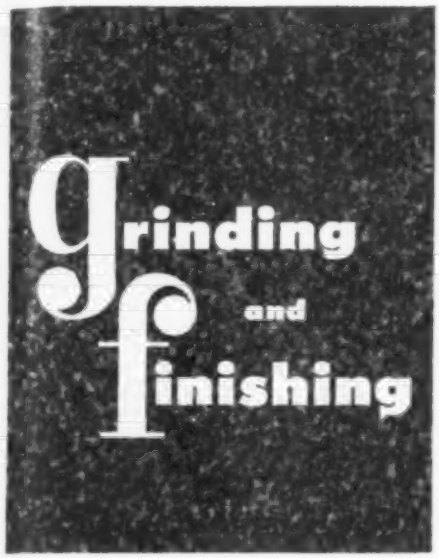


Editor's Page

Over Our Shoulder

It's been just a little over two years since the first issue of Grinding and Finishing appeared. Maybe this is a good chance for us to take a deep breath and a quick glance backward, as well as a peek into the magazine's future.

Meeting the past 24 deadlines has been anything but tranquilizing for our staff. The pace of developments in abrasive processing has been extremely fast. And the fundamental "pick-and-shovel" subjects dealing with our technology that needed to be explored and presented seemed to run us out of time very quickly as each issue was prepared.

These two facts alone—the fast-occurring developments and the fundamental subjects to be presented—give us reason to believe that GRINDING AND FINISHING has been of service. The need for full coverage of this important segment of the metalworking industry, with deeper penetration into the individual processes than is possible in a more general magazine, is the need that we've tried to meet and satisfy.

Have we been successful? You readers have told us so. Your very helpful comments and criticisms month after month have been extremely gratifying.

Along with your response to the fundamental articles we've featured has come the very great satisfaction of receiving awards, in 1955 and again in 1956, for our emphasis in the realm of safety. We were notified just as this issue goes to press that our magazine is one of several industrial publications which have earned the National Safety Council's public interest award for promoting safety during 1956. This is very gratifying to us.

But having had a look at the immediate past, what's ahead for us as a magazine? How will we continue to serve?

On the basic side, we'll be probing ever deeper into the fundamentals of abrasive metalworking processes. Frankly, we'd like to see much more of the technological fog that surrounds many abrasive techniques cleared up. In this we will gladly act as a voice for those who are isolating and attacking the problems of applying abrasives, and whose aim is the reduction of abrasive processing to a better organized and more widely known subject. We intend to show, wherever results are conclusive, that grinding and its allied abrasive techniques are stock removal methods favorably competitive with other types of machining operations.

We will also continue to report on new abrasive techniques as they are developed, so that you'll be fully abreast of this fast-moving field.

At the same time, we'll have as our aim the answering of the everyday problems submitted by our readers. It won't be too long before we'll be able to announce a monthly problem clinic running as a regular feature of the magazine, to spread the word on the tough jobs our readers are overcoming every day. Another series of fundamental articles will deal with techniques for tool and cutter sharpening.

We look forward to many more years of service to the American metalworking industry.

Jack Kenyon
Managing Editor

Three 6-18 Models . . . for Toolroom and Production Grinding

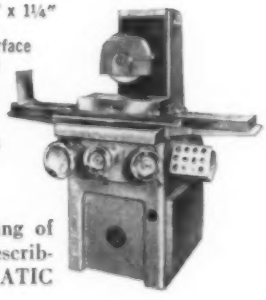
REID . . . the quality name in surface grinders . . . now has three different models in the 6″ — 18″ size. If your production schedule demands maximum automation, there's a REID 618P with power table and power cross feed. A REID 618PT with power table and hand cross feed is also available.

For tool and die makers, the hand operated 618H is ideal for precision grinding. On all models, a Cross Slide Lock is included as standard equipment.

Compare . . . check the extra features on all REID grinders . . . and standardize on quality. For complete details on models shown, write for Bulletin 618.

SPECIFICATIONS

Capacity: 6″ wide, 18″ long, 17¼″ from spindle center to table. Standard wheel 7″ x ½″ x 1¼″ included
Worktable: 51″ x 8″ overall; 6″ x 18″ working surface
Table Speed: Infinitely variable from 12 to 35 FPM
Cross Feed: Infinitely variable from .006″ to .100″
Floor Space: 71″ x 43½″
Weight: 2400 lbs.
Electrical: 3 phase, 60 cycle, 220, 440 or 550 volts
All Models Equipped with Automatic Lubrication as Standard Equipment



For Toolroom and Production Grinding of larger capacity, write for bulletin 824 describing our New All Electric 8-24 REID-O-MATIC Surface Grinder.

REID BROTHERS COMPANY, Inc.

133 Elliott Street, Beverly, Massachusetts

MANUFACTURERS OF PRECISION SURFACE GRINDERS AND PRODUCTION LATHES

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HUGE PLANO GRINDER, star of a recent demonstration at Mattison Machine Works, has a work table five by twelve feet, with clearance between wheel and table of 82 inches. Here the horizontal spindle machine is grinding machine foundation.

High Power for Fast Grinding

Stock removal frontiers are being pushed back even further by these titan grinders, built around heavy mass and horsepower. But the ceiling on power hasn't been reached yet.

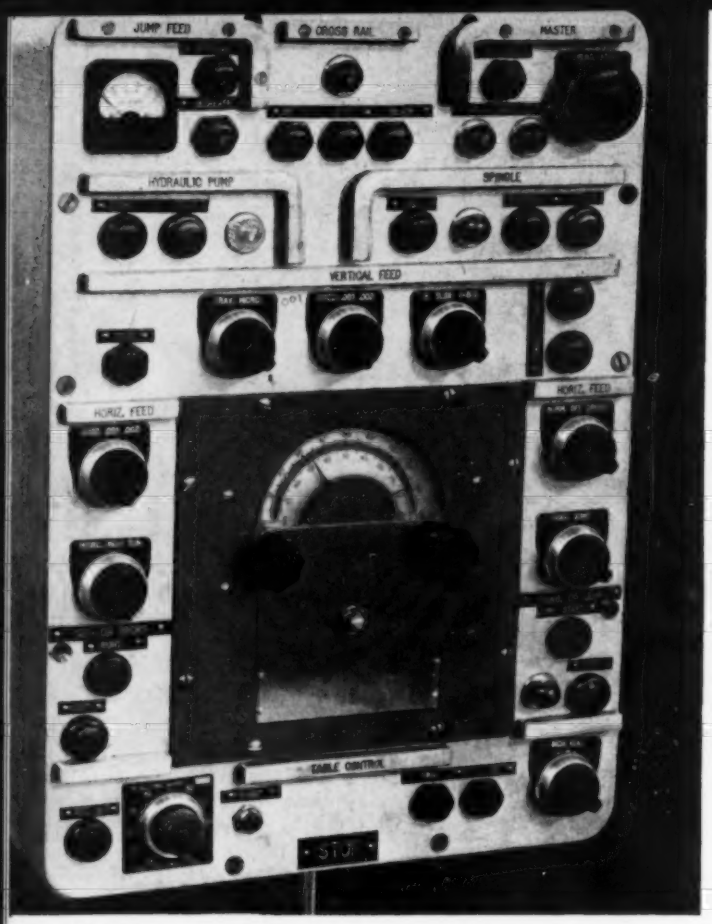
by **Jack Kenyon**

Managing Editor

● A convincing demonstration of high-horsepower surface grinding was given recently at Mattison Machine Works, Rockford, Illinois. Mattison had on its new assembly floor four huge grinders which combined the use of very high horsepower spindles and massive machine design. They showed vividly what can be accomplished in the way of heavy stock removal when you team up today's superior grinding wheels with a machine that will drive them to capacity.

As Alan Mattison, president of the firm pointed out, "These machines effectively break through a mental barrier in the minds of many production executives as to what jobs—in relation to size and stock-removal requirements—can be handled with greatest economy on grinders. Furthermore, tedious and costly operations like hand scraping can be eliminated in many cases, and a large number of machines can be designed for greater performance accuracy now that grinders like these are available."

Star of the demonstration was a new-from-the-floor-up plano type machine which weighed in at 184,000 pounds. Built for Burger Iron Company of Akron, Ohio, this grinder will be used for surfacing extremely large workpieces to close tolerances. Burger, a structural steel producer, will be able to offer its customers steel members ground to their specifications of size and surface finish, thus saving the customer the search and delay of finding a grinding shop that can handle large parts. In addition, a great



PENDANT CLOSEUP tells the story of how complete the control of Mattison's large plano grinder is from the remote station. Fine inching of cross travel helps in grinding shoulders.

MAGNETIC CHUCKS on this plano machine were surfaced within .0004-inch, well within design specifications. Burger Iron Company will grind extremely large workpieces with unit.

High Power for Fast Grinding . . . *continued*

deal of contract grinding work for the machine is expected—for example, surfacing the steel platens used in plywood presses and sheet rubber molding equipment.

The plano machine has a table five by twelve feet, with clearance between table and wheel of 82 inches. Clearance between guards is 80 inches.

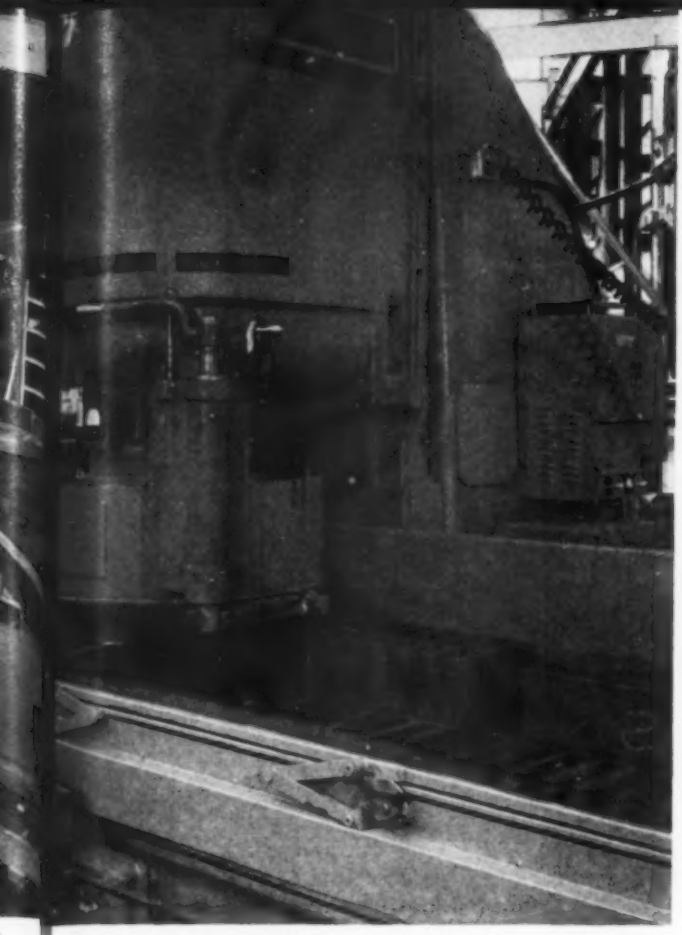
Basic design of the plano machine combines features of an open-side planer and a conventional double-upright planer. Main support for the cross rail is from heavy flat and vee-type ways on two sides of the main upright. A horizontal spindle grinding motor is hung from the cross rail of the machine. In a second plano machine of the same basic design being built for Kearney & Trecker Corporation, a combination of horizontal and universal type heads will be used to permit grinding multiple surfaces of machine tool ways. Mattison indicates that horizontal spindle motors in the range of 30 to 75 hp at 1200 rpm, and vertical spindle motors between 25 and 60 hp at 900 rpm can be provided.

Complete control of the plano machine is provided at a pendant station. Cross travel including reversal, table speeds, feed rate, raising and lowering of rail, inching table forward or reverse are among the machine functions controlled. Also, a "reverse out" button is provided that takes the table to the out position for loading and automatically stops the machine.

Mattison chief engineer Russ Holmes proudly showed that the machine table always starts in the same direction, with no guessing about which way it's going to move. An extremely interesting feature of the machine is the electronic control of head cross-travel from the pendant by means of two simple knobs. Both hydraulic and mechanical power provides both traversing or jump feed in increments ranging from ⅛ inch to 4 inches. Particularly when grinding shoulders, micrometer cross feed in increments of .001, .002, or .0002 can also be set at the pendant. Similarly micrometer vertical feed in the same increments can be set at the pendant control and actuated either by pushbutton or can be actuated by reversal of the cross slide or the table.

Although the specified accuracy of the plano machine was .002-inch corner-to-corner in 12 feet, Mattison was proud of the fact that the magnetic chucks were ground within .0004-inch corner to corner.

Three other high-powered grinders were shown along with the huge plano machine. One was the 900SS Face Grinder, a horizontal spindle grinder with 150 hp driving the 48-inch diameter segmented wheel. This machine is intended to take roughing and finishing cuts on large workpieces where stock removal requirements are very high. At the demonstration, it was taking off the high spots on a Meehanite machine tool casting at a rate of .012-inch per pass. Mattison demonstrated that it's practical to take off as much as ¼ inch from



INCREASING HORSEPOWER of vertical spindle machines like this 400SS gives high stock removal rates. With enough beef in machine, finish cuts can be made with wheel set flat.

900SS FACE GRINDER with 150 horsepower on the spindle. Up to a quarter inch of stock can be removed from castings such as this. 48-inch diameter segment wheel is mounted.

such workpieces, starting with the casting in the rough state. Table size of the 900SS is 36 inches wide and 94 inches long. The 48-inch diameter segmented wheel has an 8 x 3 inch face. Faster cutting characteristics of the segmented type wheel are ideal for this type of machine. Magnetic chucks are used. They can be either horizontal or vertical, depending on the nature of the work being handled.

Another model demonstrated was the 400SS vertical spindle machine, a conventional reciprocating table model equipped with a 100 hp spindle motor. Typical jobs within this machine's range include tables for drill presses and home workshops saws, hardened wear strips for all types of machinery, shear blades, and die blocks. A very interesting demonstration of the power requirements demanded by different workpiece designs was given. It was shown that designing the workpiece for grinding gives much better performance than if a large uninterrupted surface is ground. Recesses and grooves, which are a definite disadvantage in machining with other methods, are actually an advantage when grinding. Such recesses help break up chips and increase unit pressure of the grinding wheel on the work by reducing the contact area. This helps keep the wheel open and free-cutting when heavy bites are being taken.

Examples of interrupted and uninterrupted surfaces were ground to show that spindle power requirements go up sharply with a broad flat area to be ground on the workpiece. Of course, the stock allowances for grinding needn't be as great as with other machining methods.

The combination grinding of several surfaces in one pass is becoming more common on machines designed for way and surface grinding. One such machine was demonstrated at the Mattison show. Horizontal spindle motors from 50 to 75 hp are teamed up with a tilting vertical type grinding head of less power which drives a cup-type wheel. The table of such a machine is 42 inches wide and 120 inches long, with clearance under wheels of 48 inches.

The combination machine can grind vee-type and flat ways, dovetails, shoulder and edge work, contours and radii in one setup, maintaining all surfaces in accurate alignment. A self-contained truing device developed for the vertical spindle of this machine is adjustable from 30 to 60 degrees to dress the wheel for dovetail cuts.

On many jobs, handling of work on grinders such as these instead of on other large types of machines offers major savings in terms of machine time and in direct and indirect labor. Since they use magnetic chucks for holding parts, many jobs can be set up and ground in the same time that it would take to set up the equivalent job on another type of machine tool. However, the process planning and the design of parts should be tailored to the grinding process, to take advantage of the economies that are available when the new high-powered surface grinders are used.

Compounds permit economical

Lapping with Diamonds

Production uses for fast-cutting diamond compounds are on the increase. Once confined to tool finishing, applications now cover many materials. Here's how they do the job.

● Diamond lapping and polishing compounds are coming into more widespread use throughout the metalworking industry because of their superior ability to do a clean, fast cutting job on a wide range of materials. Originally developed for finishing of tungsten carbide cutting tools, where an agent with tremendous hardness was needed for true cutting action, diamond compounds are proving to be economical for finishing materials up and down the hardness scale. Production lapping applications for diamonds are growing, in both the flat and centerless fields. Mirror finishing of cutting tools has been established as a sure road to long tool life and better performance, and diamonds are playing an important role. The list of diamond compound applications is growing. Here's what they can do for you.

Diamonds are 4 times harder and stronger than the next hardest abrasive, standing out strikingly in a hardness comparison with other abrasive materials now on the market. Large diamonds used for turning and wheel truing operations are known to be fragile and easily fractured. But diamonds which have been crushed and shaped into fine, small shapes become more stable and less subject to fracture as the particles become smaller. As contrasted with boron carbide, aluminum oxide, silicon carbide and other abrasives, diamonds do not break up and become smaller during the lapping process. If the diamond powder has a given particle size at the beginning of a lapping operation, the particle size will remain substantially the same during the complete lapping operation. Contrasted to this permanence, other abrasives break down as soon as they start cutting and therefore take more quantity of abrasive material and take longer to do their job due to this continual break down of the abrasive particles. The permanence of the diamond particle, which cuts at a constant rate, means relatively consistent lapping times.

Vehicle Supports Particles

To take advantage of the hardness of diamonds, a vehicle had to be developed to support the diamond particles and apply them properly to the work. Prior to the development of the compound form, diamond powder was mixed in olive oil or similar oil vehicle. The mixture worked, but it was time consuming to mix and the oil could not hold the diamonds in a uniform suspension. Settling of the diamond particles remains a serious drawback of the oil-based vehicle. As a result of the difficulties of the oil-based vehicle, the diamond compound form was developed. The compound form consists of graded diamond particles held in a permanent and uniform suspension.

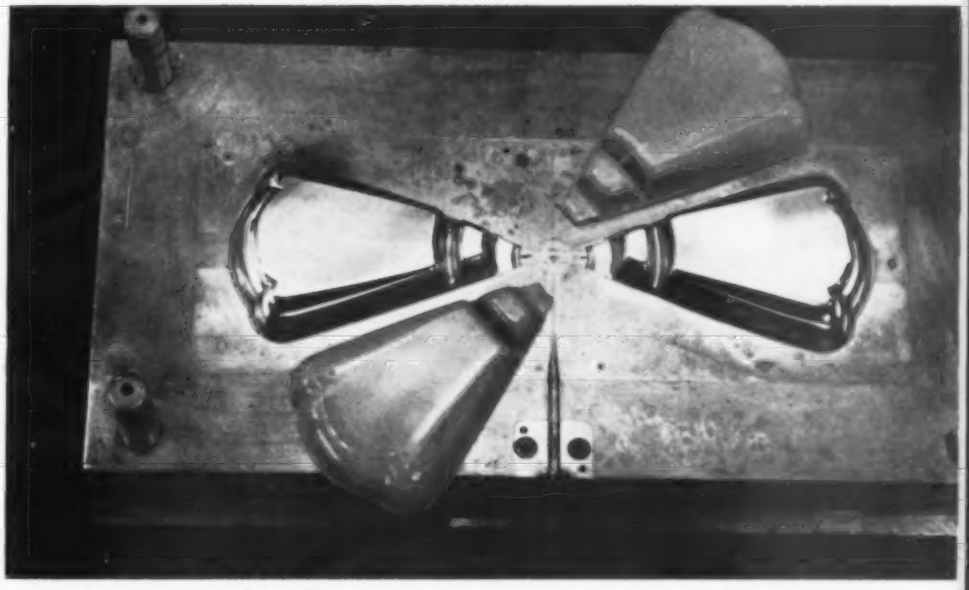
Importance of Uniform Grading

Uniformity of grading is most important to the user of diamond abrasives. The grades available range from the finest powder to grades whose application demands forceful, rapid stock removal. Due to the hardness and permanence of the diamond, the largest particle will be doing the largest share of the cutting. Large and small particles mixed in the same compound will give trouble and will raise operating costs.

On superfinishing operations, the presence of a few oversize particles will cause scratching. The lapping load will fall on the larger particles since they will be the only bearing points. Eventually the larger particles will wear down, but the compound will then be of another grade and cutting action will be slower than expected or desired. Conversely, small particles mixed in with larger particles on a job where heavy cutting is intended will do no work.

Purity of the diamond content

WIRE DRAWING DIES are a major application of diamond compounds in finishing. Here clean cutting action in polishing is essential to avoid smearing the low-microinch area which imparts proper finish to wire.



LARGEST FIELD of application of diamond compounds is in mold polishing, followed closely by polishing of drawing dies. Another important use is in preparation of metallurgical specimens. Plastic molds, shown above with molded parts, must impart mirror finish to plastics. They are usually of hardened steel, though some are of carbide. Object is to obtain close finish with true cutting action.

is important. Purity means that the diamond content be 100% diamond and not a mixture of diamond with similar appearing abrasives. Should the compound consist of 90% diamond and 10% of another abrasive, the cutting ability of the compound will be reduced to at least 90%.

Concentration is by Weight

The concentration of the compound refers to the amount of diamonds in the vehicle and is usually expressed as a weight percentage. A compound of 10% concentration consists of 10% diamonds by weight. Concentration can be varied according to the needs of the work. In general, compounds of very fine powders are on the low side of concentration and those with larger particles run on the higher side in concentration.

Particle Shape Vital

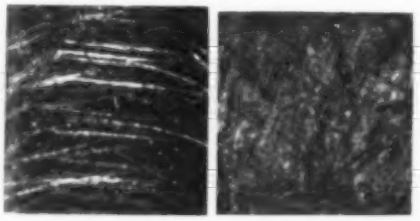
The shape of the diamond particles is important. Most manufacturers stress the need for a blocky shape, somewhat between a cube and a sphere. This shape will not scratch or dig in and has a greater strength than a diamond particle with sharp points or edges.

Prevents Settling

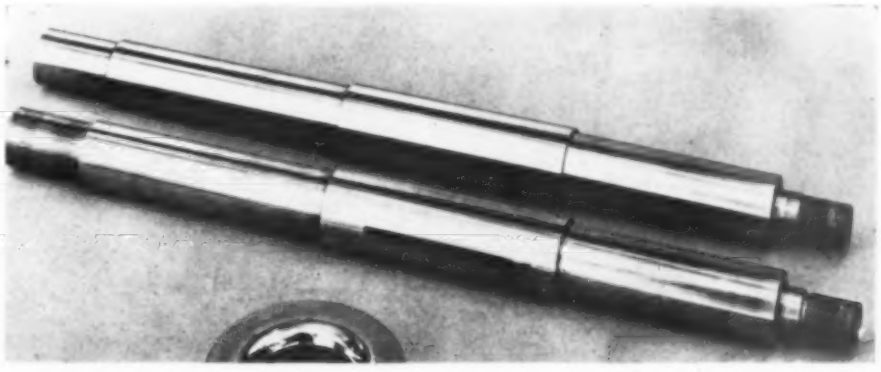
The suspension vehicle serves several functions. The primary function is to suspend the diamond particles uniformly, without settling. The vehicle accomplishes this permanent suspension by a combination of vehicle viscosity and surface tension to counteract the force of gravity. The vehicle is designed to melt under the heat of lapping and to lubricate and cool the lapping action. The vehicle is also designed to flush or remove metal chips produced by the lapping operation.

Visual Grade Identification

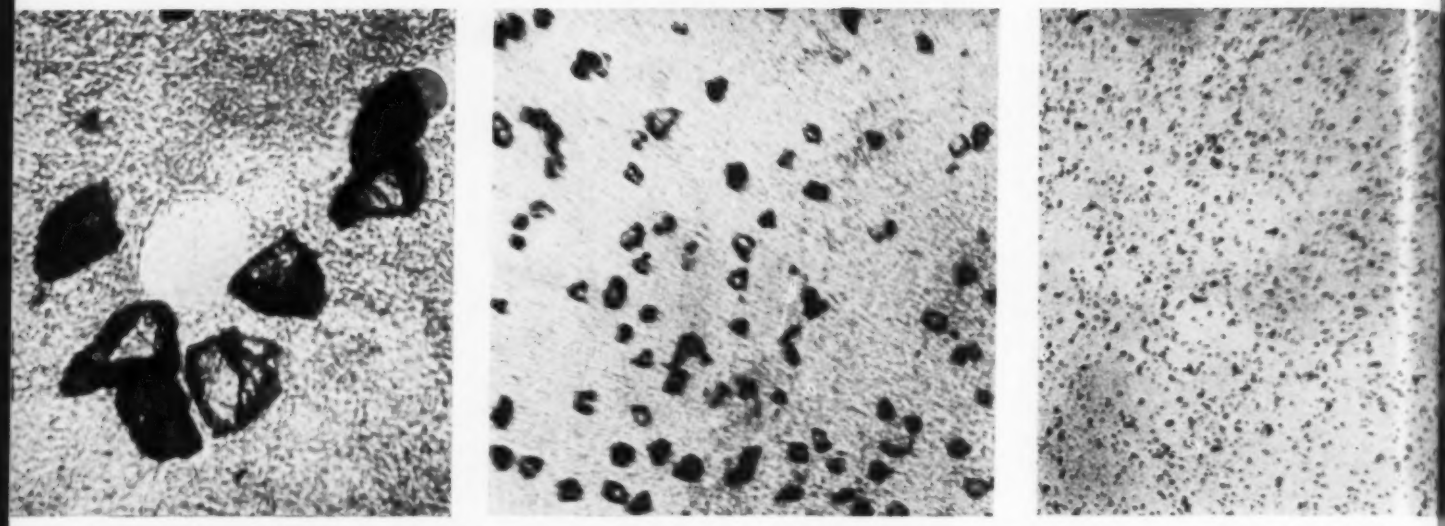
Visual grade identification of the diamond compound is attained by adding liquid color to the vehicle. Liquid coloring is used to eliminate solid pigments which might interfere with the work of the compound and vehicle. Another desirable property of the vehicle is a negative or neutral chemical action towards metals.



INSTRUMENT PIVOT surface, shown approx. 100 times magnification, showing preliminary finish with definite scratch pattern, left, and acceptable finish, right, obtained with diamond compounds.



SET OF ROLLERS for rolling precious metal. Center section has been lapped with diamond compound to low microinch finish.



MOST MANUFACTURERS of diamond compounds adhere to particle size standards set by the National Bureau of Standards. Magnified samples above show relative size of commonly used grades for comparison. Left, Number 40, a medium coarse size, has a decided cutting effect. Center, Number 8, is a general polishing agent. Number 1 size, right, does polishing only, with very slight stock removal. All diamond compound producers strive for this blocky shape as opposed to slivers, giving strength and avoiding deep scratching.

Lapping with Diamonds . . . *continued*

Packaging

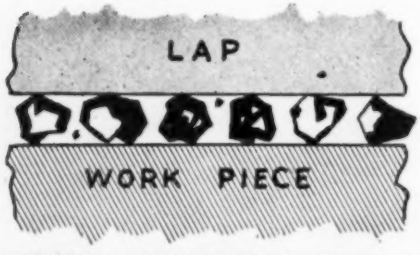
Diamond compounds are packaged in several ways. The most popular and most widely recommended means of dispensing the compound is by a metal syringe containing a cylindrical cartridge of diamond compound. The syringe dispenser enables the operator to deposit metered amounts of compound on the lapping surface quite simply and without danger of exposing the diamond compound to contamination. Contamination of the compound is almost impossible with the cartridge-syringe dispensing unit.

Contamination Must Be Avoided

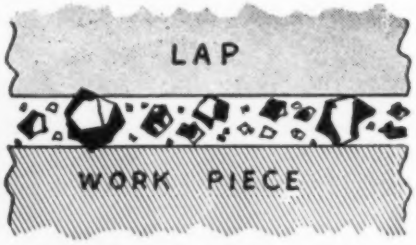
Another packaging method is the use of a collapsible tube. Metering is not as precise or as easy to gage with the collapsible tube as it is with the syringe unit. Contamination of the diamond compound is a strong possibility with the jar dispenser. Although broadly recommended for bench use, care should be taken to keep the compound free from dust and other foreign matter. Another way to dispense diamond compounds is with stick applicators, which are used for charging small point laps.

Lap Hardness More Significant

The type of lap used with diamond compounds is the same as is used for other types of abrasives. But lap hardness is more significant with diamond compounds than with the other abrasives. Selection of the right lap to establish a balance between the lap, material to be lapped and the diamond compound is very important. The lap must be softer than the work so that the diamonds become imbedded in the lap and not in the work.



UNIFORM, WELL-GRADED diamond powder gives best and most economical results. Practically all particles are cutting constantly. Resulting stock removal is fast, finish is high and uniform without scratching or pitting.



POORLY GRADED powder is wasteful and unreliable. Uneven cutting results from fact that only largest particles contact work, while small particles loaf. Scratched, pitted surface is result.

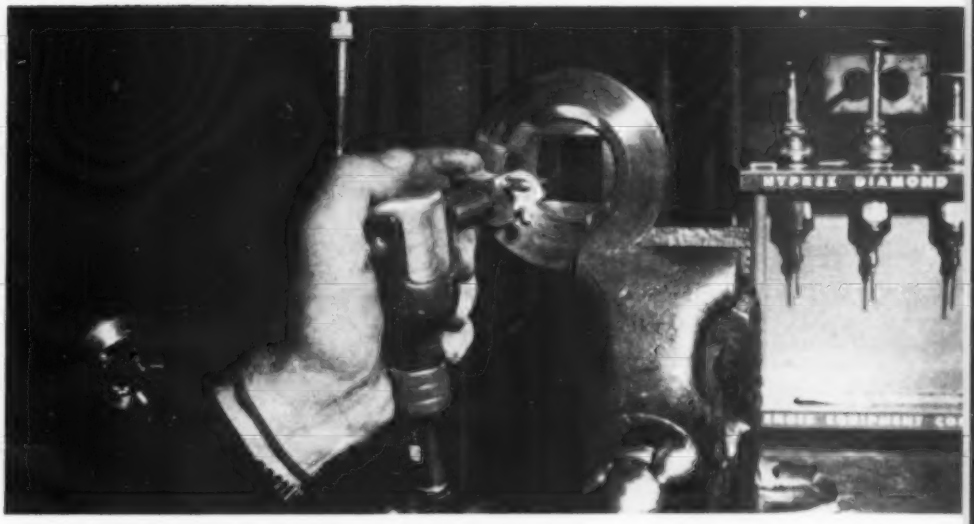
Ductile and Porous Laps

The lap may be porous, like cast iron, or of a ductile material. In the case of the porous lap the relationship between the size of the pores and the particle size of the diamond should be judged with care. With a very fine compound, the ductile lap is preferred because the diamond particles will have little opportunity to imbed themselves in the lap.

Materials for Laps

Since the lap must be softer than the work piece, a very wide range of materials are suitable. Materials can range from surgical cotton, which has a hardness of zero, to a very dense cast iron. Generally, the coarser the compound and the more stock to be removed, the harder the lap should be. Laps may be of cotton, felt, wood, plastic-impregnated wood, cast iron and many other materials. The form or shape of the lap depends upon the

RUBBER MOLDS of unhardened steel before and after finishing with diamond compounds.



ODD SHAPED DIES not suitable for polishing with rotary equipment can be best finished using diamond compound applied with a hand reciprocating machine. These are draw dies at Superior Tube Corp.

application and many lapping accessories are available in the form of plates, wheels, bobs, sticks, needles, small shoe attachments and many others.

Impact Affects Finish

The impact of the diamond to the lap gives the type of finish desired. In other words, the greater the imbedding of the diamond into the lap, the finer the finish. Thus, different lap materials will give different performance with different diamond compounds, varying with the amount of pressure applied.

Mirror-Finish Advantages

The advantage of the mirror or micro-finish to carbide and other metals is shown by the list of applications. The list is generalized to show the trends; the reasons for micro-finishing vary. Diamond abrasives are widely used for finishing dies, molds, hobs, thread guides, wear parts, gages, rolls and precision parts to name a few. Micro-finishing carbide and ceramic cutting tools, including the throwaway inserts, has been explored and found to be beneficial. The few minutes required to micro-finish are well spent.

Not Optically Flat

A micro-finish is not necessarily optically flat but is a finish on the order of 1 to 5 micro-inch. Quite frequently the term "mirror finish" is used to describe this finish which is of a high luster or shine. Moderate waviness of the surface is permitted. When tools are lapped using a lapping wheel, the surfaces will be flat and straight provided the tool holding fixtures are accurate.

The high luster finish on micro-finished tools, dies and wear parts not only improves performance but frequently means a better inspection procedure is possible. In the case of dies, molds and hobs the finish of the end product is controlled by the finish in the cavity.

Diamonds in Metallurgy

Many of the superior properties of diamond have come to light through their use in metallurgical applications. In preparing metallurgical specimens for etching and microscopic study, it's important that the surface of the metal be clean-cut rather than burnished or smeared, so that the true crystalline structure is revealed.

One of the things that research showed was whether the diamond abrasive becomes charged into the lap or whether it rolls between lap and work. It appears that a combination of the two actions occurs. Cutting is the primary action, rather than flow or transfer of surface layers, which would of course distort the crystalline structure.

The harder the materials being lapped, the cleaner the cut will be with diamond compounds. After creating a fine surface, diamond compounds in the very fine grades are proving the best media for polishing.

Effect of Improper Technique

If the lapping techniques, that is, the choice of lap, the sequence of applying the various grit sizes, or other variables of lapping operations, are not correct for the job to be done, the end results of the operation will suffer. For example, "orange peel," or light waviness, sometimes occurs from efforts at overpolishing. This is more easily created in some metals, such as stainless steels, than in others.

Machine Lapping

Diamond compounds are being successfully applied to an increasing number of machine lapping operations. In each case, the substitution of diamonds for conventional abrasives in these spots should be accompanied by modification of the lapping equipment. Because of the lasting properties of the diamonds, a small amount can accomplish the work of a large amount of conventional abrasives. Couple this with the higher price of the compound, and you can see that the equipment must be changed to accommodate diamond abrasive. For example, the serrations in a lapping plate or disc can be eliminated or made smaller in the interest of conservation. •

Wax-Type Coolant Solves Two Problems

Rust and rancidity plagued grinding operations in this plant. Wax-type coolant has proved good substitute for previous fluids, solving both problems.

● Rust and rancidity, two coolant problems for the St. Clair plant of GM's Euclid Division, have been solved by use of a wax-type coolant with rust inhibitor and bactericide.

A good brand of soluble oil had been used in the plant's 60 cutting and grinding machines when it first opened in 1950. There was no rust problem then, but tool life was not satisfactory. An average of 20 machines required coolant changes each week because of rancidity.

A synthetic coolant was then tried. Tool life increased tremendously and down-time for coolant changes was reduced by two-thirds. Only six to eight machines had to have coolant changes each week because of rancidity. However, signs of rust cropped up, threatening to more than offset savings the coolant had produced.

Six coolant manufacturers were called in for tests. The coolant desired had to at least equal or better tool life, at the same time eliminating the rust problem.

Each coolant manufacturer was assigned several machines and given two to three months to prove his product. The one selected for plant-wide use after the testing period was Johnson's Wax No. 230 J-Cool, a waxy-type coolant with built-in rust inhibitor and a bactericide.

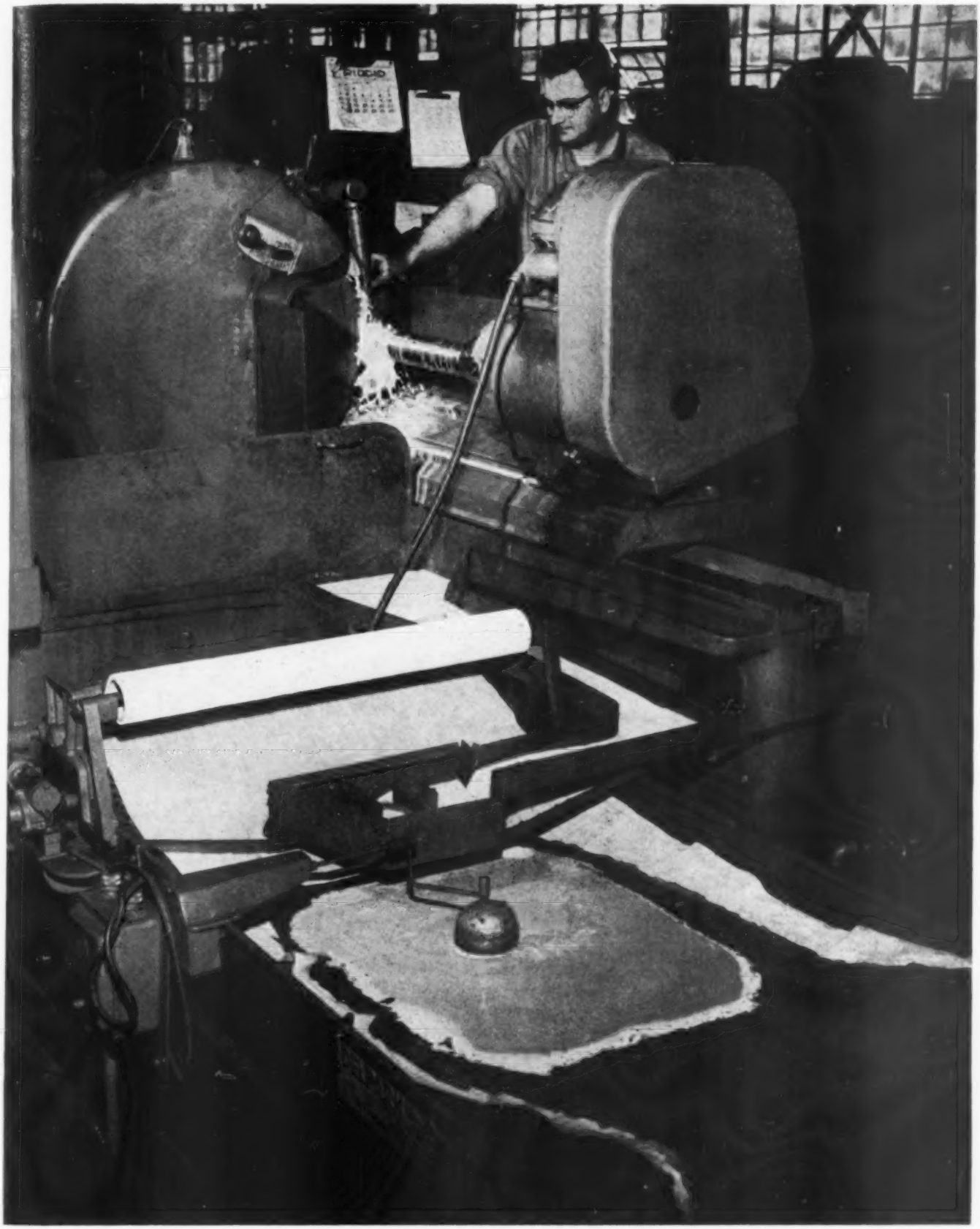
The waxy-type product performed more than satisfactorily. However, one Monday morning about three weeks after the entire plant had been converted, the coolant in two of the machines showed signs of turning rancid. Samples of the coolant were flown to the supplier's research laboratories in Racine, Wisconsin. Tests there showed that the coolant had become contaminated by a particularly virile strain of bacteria. The laboratory recommended that the machine be cleaned and treated with a strong solution of bactericide and that the coolant itself would then resist further contamination.

This was done and now nearly a year later, no rust has occurred, rancidity has been practically eliminated and tool life is at a peak. In place of changing coolant on 20 machines a week as with the soluble oil, or even six or eight machines a week as with the synthetic, an average of only one machine a month is now changed because of rancidity.

An additional time-saving bonus has resulted from use of the wax-type coolant. When using the synthetic coolant, a full working day was required to test two machines to determine coolant dilution. The new coolant can be tested in a matter of minutes.

Good plant housekeeping and management practices also contribute to the dramatic results obtained. The shop has two 500-gallon tanks centrally located. One of them contains the concentrate and the other a 40-1 dilution of the water soluble coolant. When a machine operator believes his coolant requires additional diluting, he notifies his foreman. In the quick test, the foreman may determine that the dilution is as low as 10 to 1. Adding a 40 to 1 dilution would be wasteful, so clear water is added to bring the coolant to the proper dilution. In some instances, 100 to 1 dilutions give maximum performances.

Use of efficient coolant filters also has effected savings. Most of



PART BEING GROUND on this Norton 14 inch LCTU semi-automatic machine is a piston rod for the steering post on Euclid's Model 27 tractor. Stock removal on the steel forging runs .025-.030 in roughing, finishing to a 16 to 32 micro finish. Wheel is 30 x 2 x 12 Cincinnati, 2A60 16 VN, removing .001 stock per traverse at 24 fpm traverse speed.

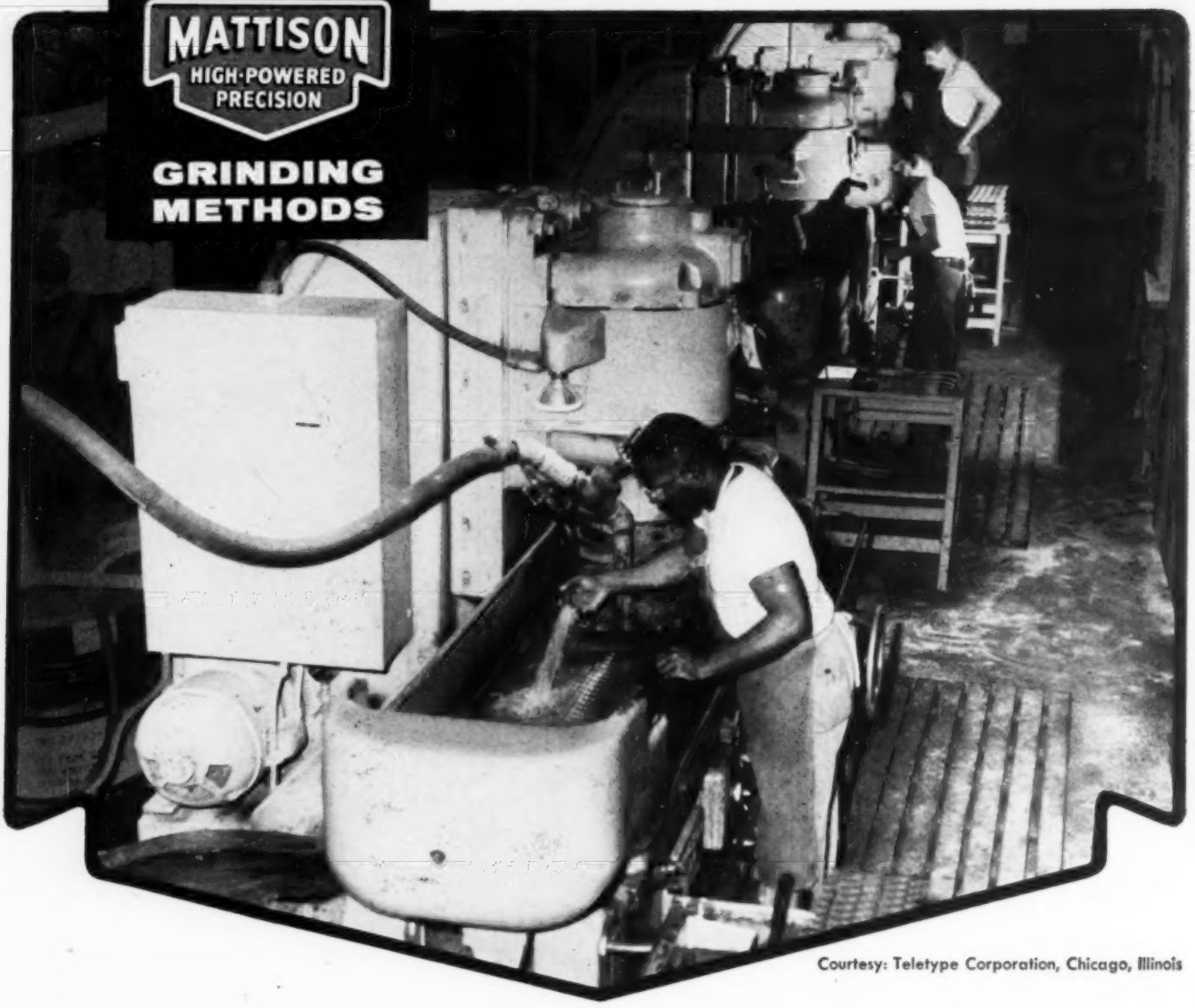
the plant's machines are equipped with individual filtration units using roll-type paper filters.

Rate of coolant usage in the plant has also decreased. Best performance with previous coolants was approximately 300 gallons a month. Now 150 to 175 gallons of coolant are used a month. • •

CASE HISTORY NO. 39—SMALL STEEL PARTS

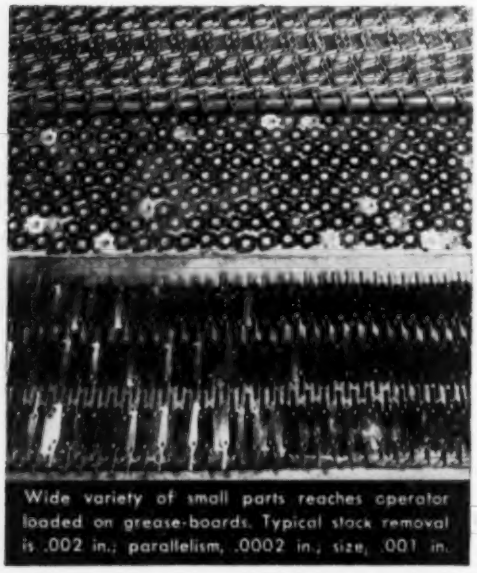
MATTISON
HIGH-POWERED
PRECISION

GRINDING METHODS



Courtesy: Teletype Corporation, Chicago, Illinois

Grease-board loading, high-powered surface grinders speed production of precision small parts

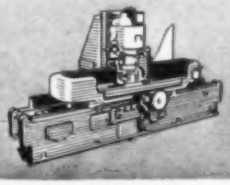


Wide variety of small parts reaches operator loaded on grease-boards. Typical stock removal is .002 in.; parallelism, .0002 in.; size, .001 in.

Vital stamped steel parts are finish-ground to close tolerances at rates up to 700 per hour, by the Teletype Corp., Chicago, Ill. Use of grease-board loading and high-powered Mattison Vertical Spindle Surface Grinders makes this performance possible.

Over 2,000 varieties of parts are ground on three heavy Mattison machines. Most are moving components of sensitive communication and tabulating machines. Boards with 100 or more pieces held with axle grease are delivered to each operator. He reverses the board on the magnetic chuck to quickly load the grinder . . . greatly reducing setup time. Parts are loaded on the boards right from the punch presses. Two of the Mattison grinders used in this plant have been in service for ten years and the third for six . . . without a shutdown for major maintenance. They are presently used 16 to 18 hours a day, 6 days a week, holding tolerances on production runs to .0002 in. The heavy base and column construction, longer V and flat ways for both head and table, and over-all rigidity of Mattison Vertical Spindle Surface Grinders make this heavy-duty repetitive grinding possible. See your Mattison dealer for full details.

MATTISON
MACHINE WORKS
ROCKFORD ILL. U.S.A.



HIGH-POWERED
PRECISION
SURFACE
GRINDERS

Use postpaid card. Circle No. 220

Stainless isn't difficult to work, but *IS* different. Here are basic rules for applying wheels and belts for surface finishing, with instructions for heading wheels in the shop.

A guide to

Stainless Steel Finishing

By **W. E. McFee,** Supervisor,
Product Information Service
Armco Steel Corporation

● It has been said of stainless steels that they are not difficult to work, just different.

This applies to grinding and polishing as it does to other fabricating operations. You can use standard equipment all the way through, keeping in mind these basic three points:

1. Stainless steels are harder and more abrasion resistant than most carbon steels.
2. They have less than half the thermal conductivity of carbon steels.
3. The chromium-nickel grades have about 40% higher coefficient of expansion than carbon steels.

These properties call for more care in surface finishing. Hardness and abrasion resistance decrease rate of metal removal, which cannot be offset by increasing wheel pressure. Any grinder who attempts it will see the metal overheat because of low thermal conductivity. Discoloration and distortion or warping are the result, especially in light gages.

Solid Wheel Grinding—Use vitreous bonded wheels to grind relatively heavy stainless sections to dimensional accuracy. "Solid" wheels are most effective when used on rigid precision machine tools. Rubber or resinoid bonded wheels are usually preferred for such work as rough surface grinding of stainless bar and wire products, forgings and weld beads. They cut more smoothly and are less liable to load than vitreous wheels.

Flexible Wheel Grinding and Polishing—"Flexible" grinding and polishing are most effective where surface quality is the first consideration and size tolerance is not exacting. Using coarse grits, it will remove metal in considerable volume. This is why the method is frequently used to reduce weld beads. With progressively finer grits, flexible type wheels and belts will produce standard commercial finishes.

Wheels and Belts

These are the commonly used flexible grinding and polishing wheels and belts used on stainless steels:

1. Shop-Headed Wheels
   (a) Canvas wheels are made of

WELD BEAD being ground with shop-headed flexible wheel after snagging with a solid wheel. With progressively finer grits, flexible type wheels will produce standard commercial finishes.

Stainless Steel Finishing . . . *continued*

canvas discs cemented or sewed together. They are excellent for heavy work using coarse abrasives from 24 to 46 grit.

(b) Stitched muslin wheels are widely used for work ranging from coarse grinding to fine polishing. They may be purchased assembled in desired size and width or shop-made by gluing or cementing together standard buff sections.

(c) Solid felt wheels are generally used with 150 and finer grit for high polishes.

(d) Compress wheels are the rule when a formed wheel face is necessary. They also are well suited for much of the work done by the stitched muslin wheel. Wheel faces usually are made of rectangular blocks of leather, canvas, felt or walrus, radially compressed and assembled into steel side plates. Block construction permits accurate control of hardness or density of wheel face. The face retains its shape when formed to fit the contour of the work owing to the bias assembly of the segments.

Other types of wheels range from super-soft to very hard. Each has its own usefulness. When in doubt consult wheel manufacturers to determine the one right type of wheel for the work to be done.

Factory-Coated Strips, Belts

Factory-coated paper and cloth abrasive belts and strips are widely employed by fabricators of stainless steel—for everything from rough grinding to fine polishing. They are used:

(a) In paper or cloth strips applied to the face of special rubber contact wheels.

(b) As endless cloth or paper belts with backstand idlers over cushion wheels on polishing lathes and swing grinders.

(c) As endless abrasive belts on hand-block sanders. Here the flexible wheel is replaced with a canvas-faced, curved hand-block of cork.

(d) To surface various types of wheels and discs employed on flexible shaft machines.

Long used to polish wood and other soft materials, sand belts are now being applied to stainless steels. But the method of application is somewhat different. Point or line contact must be established to concentrate cutting action of the abrasive grains. On a polishing

TABLE I

Size of Aluminum Oxide Grain (Grit Number)	% Glue by Weight	% Water by Weight
24-36	50	50
46-54	45	55
60-70	40	60
80-90	35	65
100-120	35	67
150-180	33	70
220-240	25	75

ABOVE, HIDE-GLUE mixtures for shop-heading flexible wheels. As grits become progressively finer, glue-water ratio should decrease. These are mixtures for wheels operating at approximately 7500 sfm. For higher speeds, glue content should be increased by about five per cent for denser head.

RIGHT, POLISHING LATHE with stitched muslin wheel. The semi-automatic gun mounted on wheel guard sprays mixture of abrasive and glue. Heat of the wheel dries the mixture quickly.

lathe with backstand idler there is line- or point-contact because the work forms more or less of a tangent against the wheel. When using hand-block sanders a curved shoe hand-block provides line contact. It produces fast, efficient and uniform finishing where a flat-faced hand-block with its area contact would be impractical.

Flexible contact is another "must" for grinding and polishing with abrasive belts. When an abrasive belt is used on a polishing lathe, the work wheel on the spindle must have some "give." This is why contact wheel faces are made of rubber or of leather- or canvas-segments. Many degrees of hardness are available to provide the desired cutting effect.

Advantages of factory-coated abrasives are:

1. Shop-heading operations are eliminated.
2. They possess utmost uniformity and quality. Shop coating requires skill and care in mixing grits of different sizes.
3. They permit more extensive use of abrasive belts, since they provide much more abrasive surface than a wheel or roll. For example, a 10" abrasive wheel has a circumference of about 31½". When it is replaced with a resilient work wheel and back-stand idler, endless abrasive belts 84" to 168" long are frequently used. Therefore the available abrasive surface is three to five times longer than that of the abrasive wheel. The belt also can cool in its travel around work wheel and idler.

This can be seen as a further advantage in grinding and polishing stainless steels. Being hard and abrasion resistant, considerable heat is generated in surface finishing these metals. Abrasive coated surface on a wheel is relatively small as compared with a belt. Thus cooling time for each grain between cuts is very limited. Heat tends to soften and weaken the glue bond and is one of the causes of grain loss. Better cooling afforded by belts often will remedy this loss.

Abrasives for Stainless Finishing

Aluminum oxide is the most commonly used abrasive for grinding and polishing stainless steels. Aluminum abrasives are generally preferred to silicon carbide because of greater point endurance on materials having the high tensile strength of stainless steel. Also their crystals are resharpened due to the peculiar nature of their fracture.

Size of the individual abrasive grain is indicated by a number. This relates to the number of meshes per inch in the screens used to size the grains. It is also known as the "grit" of the grain. No. 20 grit, for example, has abrasive grains that will pass through a screen having 20 openings per linear inch, but will be retained on a screen with 24 openings per linear inch. No. 30 grit will pass through a 30 mesh screen but be held on a 36-mesh screen.

Abrasives used on stainless steels must be very hard and tough; uniform in composition, structure and size; and be securely bondable to wheel or belt. Firm bonding requires high capillarity to permit easy wetting with the glue solution by surface treatment of the grain.

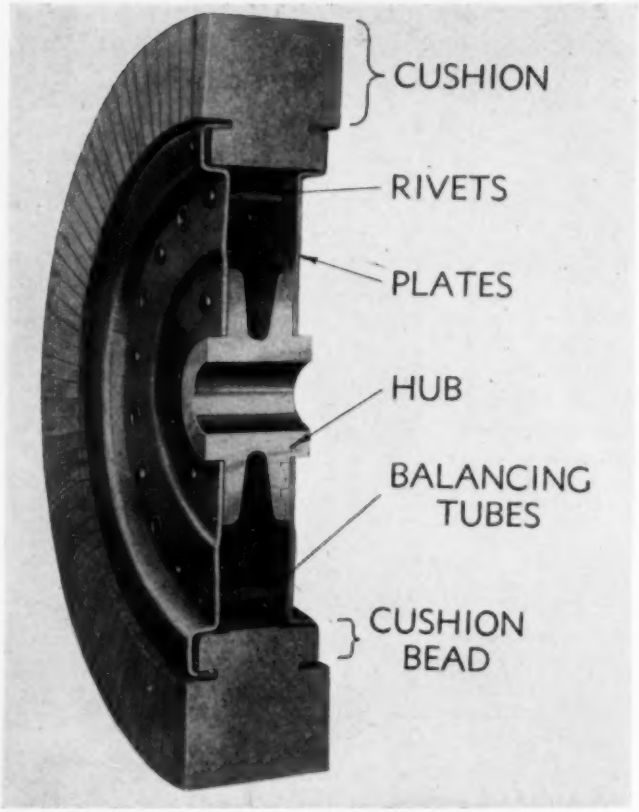
Grit sizes for shop-heading should be kept separate. If they become mixed they should be properly screened and separated. A few coarse grits among fine can spoil the work of fine grits and result in costly re-polishing through the various stages.

Abrasives must be clean, free from iron, and used only on stainless steel.

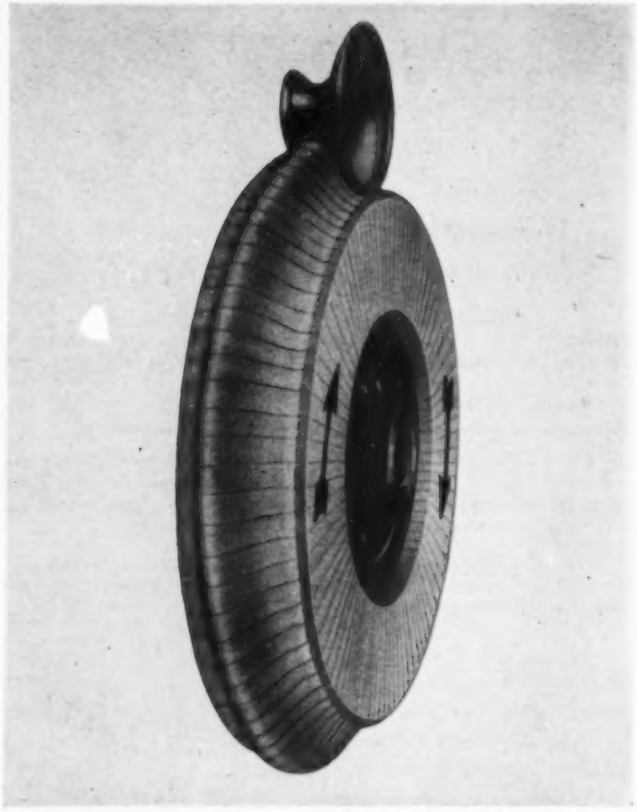
Natural emery contains iron and should not be used in grinding and polishing stainless steels. Artificial emery is recommended.

Shop-Heading Wheels and Belts

While factory-coated abrasive wheels and belts are being used more and more, shop-heading is still common practice. Wheels and belts can be set up with the grit necessary for the job, and polishing sequences are readily devised for economical grinding and polishing.



CROSS SECTION OF compress wheel illustrating block construction. It offers among other advantages long life and easy balancing. Wheel face is headed with glue and abrasive.



COMPRESS WHEEL formed to fit part contour. Leather block-faced wheels can be shaped accurately. They retain their shape even when turned to sharp corners or tapered to narrow faces.

Stainless Steel Finishing . . . *continued*

Muslin Wheels. Composite cloth wheels give the needed resilient backing to the abrasive grit glued to the wheel face. The stiffer the wheel the faster it cuts. Softer wheels have a reduced cutting rate but produce a finer finish with the same grit.

Built-up cloth wheels are made by gluing or cementing together sewed muslin buffs to the required wheel-face thickness. Each circular buff section is usually ¼" thick and consists of cloth layers sewed together by spiral, concentric or radial stitching.

Degree of resilience or stiffness is controlled in different ways. For utmost stiffness the laminated discs are glued from hub to near periphery. The closer the rows of sewing in the buff section, the harder the wheel. When the cloth weave is fine and tight, the buff will be stiffer and last longer. Buff sections with cloth thread count of 64/64 or 64/68 are recommended for use on stainless steels.

Hardness of a flexible wheel is governed by contours of the work piece. Progressively greater flexibility brings larger coverage.

Glue. High quality animal hide glue is recommended for bonding the abrasive to its backing. However, cements and cold glue preparations are sometimes used.

Mixing. Table I gives hide glue mixtures for average requirements.

These mixtures are for wheels operating at approximately 7500 surface feet per minute. At higher speeds, such as 9000 S.F.P.M., glue content in the mixture should be increased by about 5 per cent by weight for a denser head.

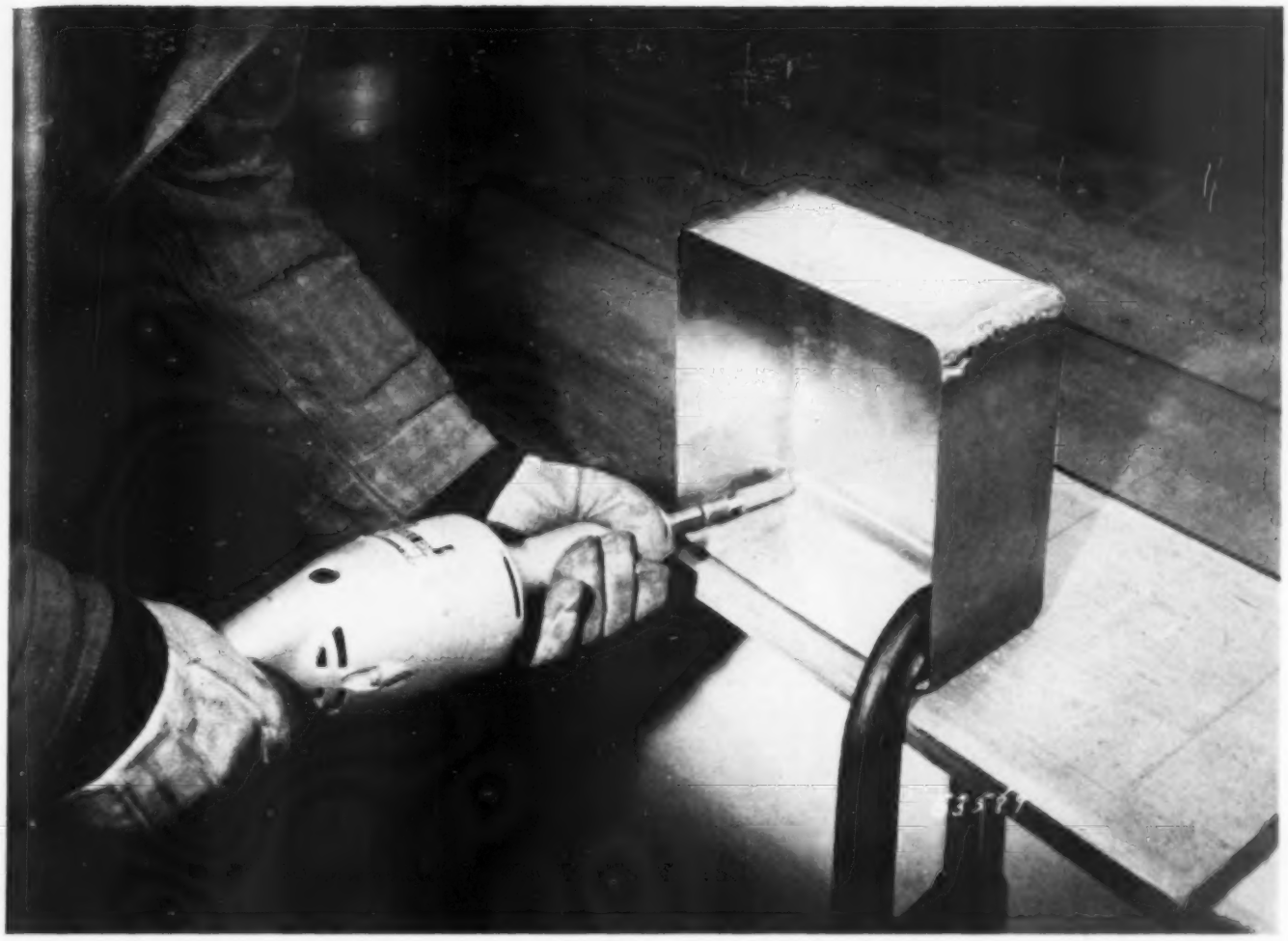
Soaking. First dissolve the glue by soaking in cold water before heating. One hour soaking is recommended for ground glue; 12 hours or longer for flake glue.

Melting. Heat only enough glue for the work at hand. Usually a 3-hour supply is enough. Use stainless steel or porcelain enameled glue-pots with water-jacketed heaters. Keep gluepot, brushes and other utensils clean and sterile to prevent bacterial growth and pollution of succeeding batches. Use a different brush for each grain size so that grits will not become mixed.

For preheated wheels and abrasives, apply glue at 140 F.; for wheels and grains at room temperature 160 to 165 F. Temperature of glue should be controlled by thermostat, with a thermometer in the pot as an added precaution.

Truing. Factory-made stitched muslin and canvas of felt wheels come trued with nap laid back ready for sizing. But shop built-up wheels first must be trued on the polishing lathe spindle with a commercial buff rake or sharp cutting tool. The latter can be made from an old file. To true, the nap is laid back on the face of the wheel. To keep the nap lying in the same direction, operate the wheel in the same direction as when trued. Paint an arrow on the side of the wheel after truing to indicate proper rotation and to insure longest wheel life.

Sizing. Before applying abrasive



CARBIDE BURRS are useful for cutting down stainless steel weld beads. High speeds are necessary. Tree-shaped burrs are handy.

to a new cloth wheel, size the surface with one or two coats of a light 5 to 10 per cent glue solution. Then preheat the wheel and apply the glue hot. Dry thoroughly after each coat. When dry, mount the wheel on a lathe spindle and rub lightly with abrasive stick or lump pumice while the wheel runs at operating speed. This will raise the nap a little and promote adhesion of the abrasive coating.

Abrasive Coating. When sized and dried apply the hot glue to the wheel face with a brush, using the glue mixture recommended for the grit number. Roll the wheel in the trough of abrasive grit until it has picked up all the grain it will hold. Perform this operation quickly to minimize jelling of the glue during set-up.

Also pre-heat both abrasive and wheels to prevent the glue from jelling too rapidly. A temperature between 100 and 120 F is recommended with the glue at 140 F. When not preheating, rapid jelling can be retarded by using the glue at 160 F. Apply two coats of glue and abrasive, the second coat 20 to 25 minutes after the first.

Pressure exerted to roll the glued wheel in the grain trough has an important bearing on abrasive action. When a 200 pound man and a 130 pound man set up wheels, each using his utmost strength and weight, the heads produced by each will deliver different polishing results. This leads to non-uniformity of product.

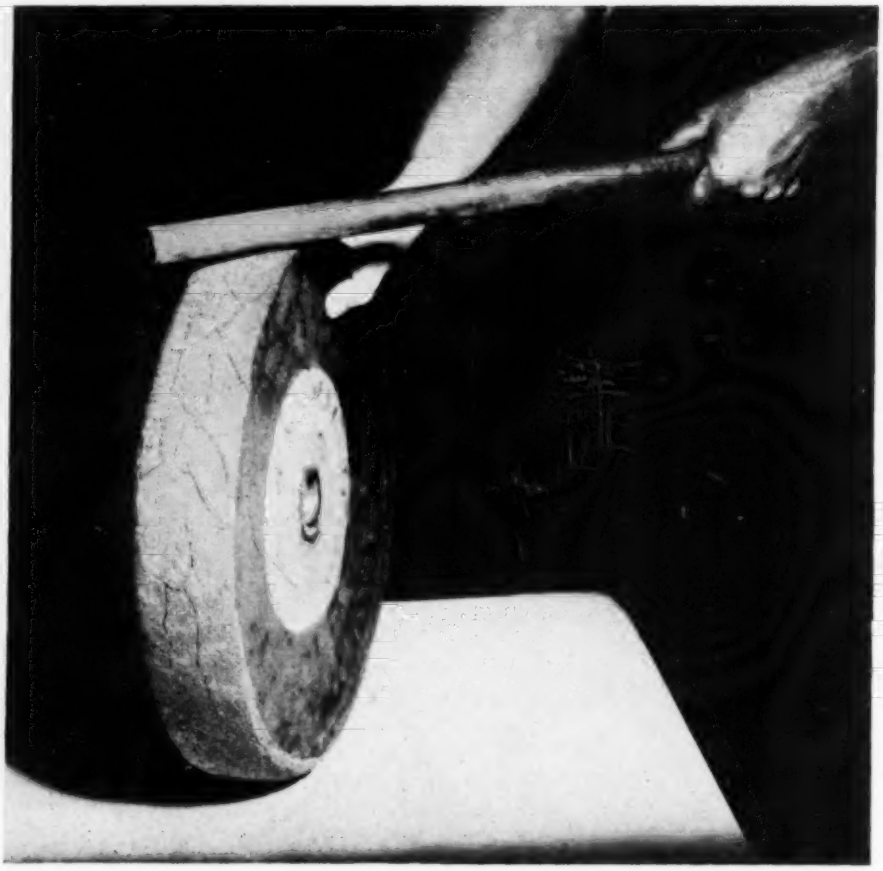
Heavy pressure is not needed for proper penetration of grains into glue coat. Power driven wheel heading machines are highly desirable in large production polishing, because they insure controlled and measured pressure while rolling the wheel. They also serve to keep the abrasive grain heated.

Drying. Do not put abrasive headed wheels to work till they are properly dried. Reduce moisture in the glue to content that makes for greatest strength. With hide glue it is 10 to 12 per cent. Over-drying produces a brittle short-lived wheel. Grains tend to tear out of glue sockets. Underdried wheels will cut slowly, glaze and overheat.

Dry wheels in a controlled temperature drying room if possible. Use an exhaust fan to speed evaporation. Temperature of 85 F with relative humidity 50% are ideal for drying. Other satisfactory conditions are 75 F at 45% relative humidity and 90 F at 55%.

Wheel drying time depends on wheel head thickness. This in turn is affected by glue strength, number of coats and grain size. Remember that for the same number of coats the head for coarse grain will be thicker than for fine grain and will take longer to dry. One-coat abrasive wheels usually dry in about 24 hours; two-coat heads in about 48 hours.

Cracking. This must be done before putting a newly dried wheel into service. Strike the abrasive head lightly with a round bar or pipe. It makes the wheel more flexible, and is also a good test of a



THIS IS THE PROPER way to crack a wheel head. Done before putting newly-dried wheel into service, wheel is struck lightly with round bar or pipe at about 45 degree angle with wheel axis. This makes wheel more flexible, is also a good test of properly dried wheel.

Stainless . . .

properly dried wheel.

More specifically, strike the wheel head diagonally at about a 45° angle with the wheel axis at intervals over its circumference. Then repeat at a 45° angle from the opposite side of the wheel, to form an "X" with the first series of cracks.

Balancing. Always balance built-up wheels before using. An unbalanced wheel will rumble, vibrate, chatter, shed grains at one spot and demand frequent reheading. First see that the wheel bushing has a good fit on the machine spindle for the wheel to run true.

In the preferred static balancing practice, the wheel is slipped on a true arbor, which in turn is mounted on a roller stand where it can rotate freely. Lead washers are then fastened to the light side of the wheel. Some leather and canvas faced wheels have balancing tubes in their pressed steel hubs. Balancing lead may conveniently be anchored in these tubes for proper balance.

Resurfacing. Built-up wheels can be reheaded until they are too small to use. In the widely used "dry" method the worn wheel is first cleaned of dirt and oil. The face is then dressed and trued with a silicon carbide brick or special carbide tool in a wheel dressing machine. Only enough of the old head is removed to provide a clean base for reheading. Wheels worn through the sizing must be resized. When dressed and trued the wheel is headed in the usual manner.

In the "wet" method the worn abrasive head is removed by dissolving the glue in a water bath. It is not suitable for all types of wheels and requires an experienced operator.

Cement Coating. Cold cements for wheel heading possess some advantages over hide glue. No heating equipment is needed; there is less possibility of wasted glue; and drying time is much shorter, varying with different brands of cement. Otherwise, wheel heading practices are about the same as for hide glue.

Even after cracking, cement headed wheels are not as flexible as glue-headed wheels. Yet they cut faster and are more effective on roughing operations by reason of their harder bond. Using the same grit number, abrasive grains set in cement will produce a coarser finish than when set in hide glue. This is why finer grits must be used on cement wheels for equal finish.

Sprayed Wheel Heading. This method utilizes air pressure to spray a mixture of abrasive grains and cold glue directly on wheel or belt. A special spray is used and the mixture is drawn by hose from a pressure storage tank. Grit sizes usually range from No. 80 to No. 600. Resurfacing time and labor costs are greatly reduced by this method.

The spray gun also can be used to rehead wheels between operations. The gun services a number of wheels. Or, a semi-automatic gun can be mounted on a machine and operated by foot pedal. This way the operator can intermittently renew the head on his wheel. Heat of the wheel dries the mixture of abrasive and glue almost instantly. The same may be adapted with cam-operated guns to straight line or rotary automatic polishing machines. Do not use grease stick or lubricant. The work must be free of grease and oil to prevent the cold glue from adhering. • • •

Surface Grinding

HORIZONTAL SPINDLE—RECIPROCATING TABLE

IN THIS SERIES—

1. ADVANTAGES—APPLICATIONS—ECONOMICS
2. FUNDAMENTALS AND METHODS
3. MACHINES, ATTACHMENTS, SPECIAL DEVICES
4. WHEEL SELECTION AND WHEEL FORMING
5. CAUSES OF FAULTY SURFACE GRINDING AND CURES

Part 4: Wheel Selection, Forming, Dressing

Prepared by the editorial staff of GRINDING and FINISHING and Edmund Mottershead of Mottershead Associates.

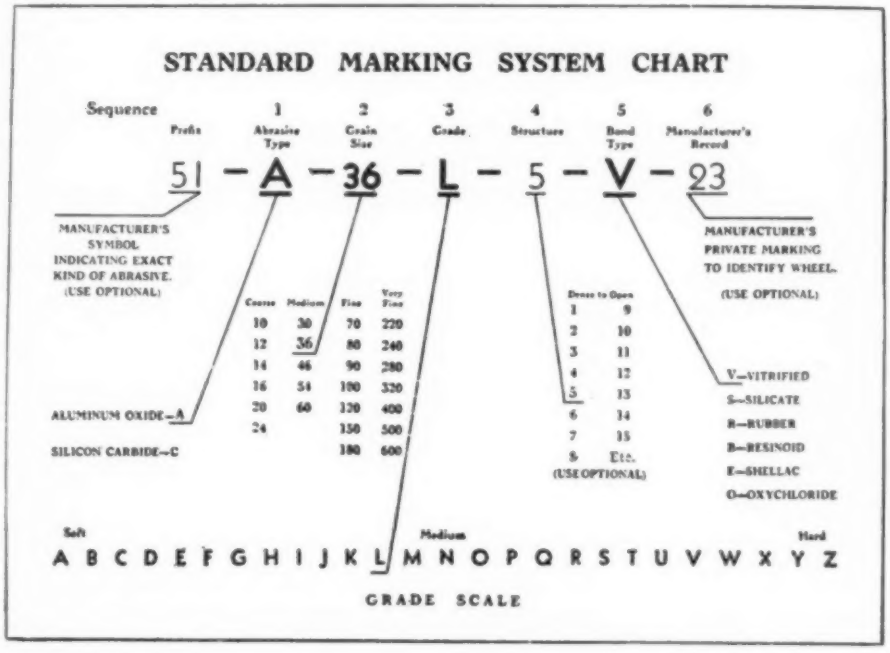
● The subjects of wheel selection and wheel forming and dressing are logically related because within reasonable limits a wheel which is not ideal for a particular job, but merely close, may be dressed and manipulated in the grinding process so as to more nearly approach the "ideal" wheel for the job.

Other things being equal, regulating the table traverse, wheel speed and downfeed can radically alter the behavior of the wheel from hard to soft or vice versa. Similarly, the wheel may be dressed free cutting for rough grinding or fine for finish grinding, and so handled in dressing that it may be "hard" or "soft" in use.

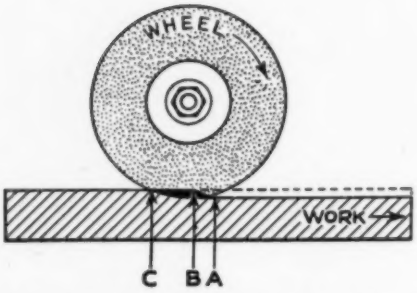
Selecting an abrasive wheel for a given surface grinding job need be no more difficult than selecting a lathe or planer tool of the proper style, cutting material and angles to fit the casting or forging material and the requirements of the job. The answer may be summed up in a general understanding of how the wheel cuts, the composition of grinding wheels, the system of marking them, and the factors to consider when selecting a wheel.

As shown in the illustrations and captions on these pages, the real cutting action of a grinding wheel properly dressed produces a microscopic chip characteristically long and fibrous in nature, just like any other metal cutting tool which delivers a similar but larger chip. The makeup of the wheel, including bond, grits, and porosity determines its nature as to "hard" or "soft", free cutting or other characteristics. These elements are calibrated, as shown in the wheel selection chart,

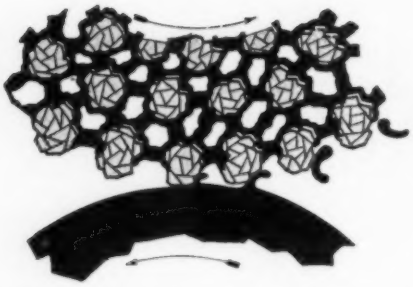
Face of grinding wheel which is severely loaded.


STANDARD MARKING SYSTEM CHART
Sequence
1 Prefix
2 Abrasive Type
3 Grain Size
4 Grade
5 Structure
6 Bond Type
7 Manufacturer's Record
51 - A - 36 - L - 5 - V - 23
MANUFACTURER'S SYMBOL INDICATING EXACT KIND OF ABRASIVE. (USE OPTIONAL)
ALUMINUM OXIDE—A
SILICON CARBIDE—C
Coarse 10 12 14 16 20 24
Medium 30 36 46 54 60
Fine 70 80 90 100 120 150 180
Very Fine 220 240 280 320 400 500 600
Dress to Open 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Etc. (USE OPTIONAL)
MANUFACTURER'S PRIVATE MARKING TO IDENTIFY WHEEL. (USE OPTIONAL)
V—VITRIFIED
S—SILICATE
R—RUBBER
B—RESINOID
E—SHELLAC
O—OXYCHLORIDE
Soft
Medium
Hard
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
GRADE SCALE

Face of the same wheel after proper dressing.



CUTTING ACTION of an abrasive wheel as it attacks a flat surface. The sharp abrasive grain on the periphery starts to cut at point A. While the grain rotates from A to C, point C on the work will move only as far as point B because the table speed is much slower than the sfpm of the wheel. The grain forced into the work removes a chip represented by the dark area. Chip size can be increased by increasing table speed, depth of cut, or rate of cross feed.



HOW THE VOIDS in the internal structure of the grinding wheel assist in clearing chips from the wheel face and hence reduce or eliminate "loading." Coarse grit sizes generally have larger voids between and will cut bigger chips and remove more metal. By the same token, they leave a rougher surface on the work being ground.

SHAPE OF METAL CHIPS produced by a grinding wheel which is cutting correctly. Note that the chips are relatively long and thin, resembling very greatly the shape of the chips considered to be satisfactory in milling and lathe operations which remove metal in similar, though larger chips.

according to numerical and letter symbols which are standard in the industry.

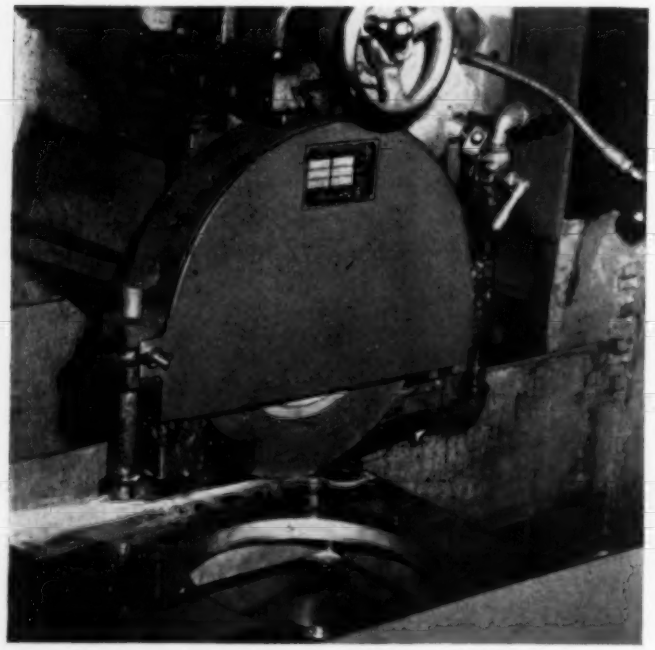
There are two types of abrasives used in the manufacture of most grinding wheels, aluminum oxide and silicon carbide. Both are produced by chemical reaction in the intense heat of the electric furnace. Their differences in penetration, hardness, strength, and attrition resistance make each abrasive best suited to certain types of work with certain materials.

Silicon carbide abrasive is generally considered to be both harder and stronger than aluminum oxide, which makes it generally more efficient on the hard cast irons. On the other hand, it dulls more rapidly than aluminum oxide when grinding the soft and hard steels. The general rule thus is to select aluminum oxide abrasive for surface grinding steels of all kinds, including the hard stainless steels, annealed malleable iron and tough bronzes; use silicon carbide for surface grinding gray iron, chilled iron, 18-8 stainless, brass, soft bronze, aluminum, rubber, hard facing alloys and the cemented carbides.

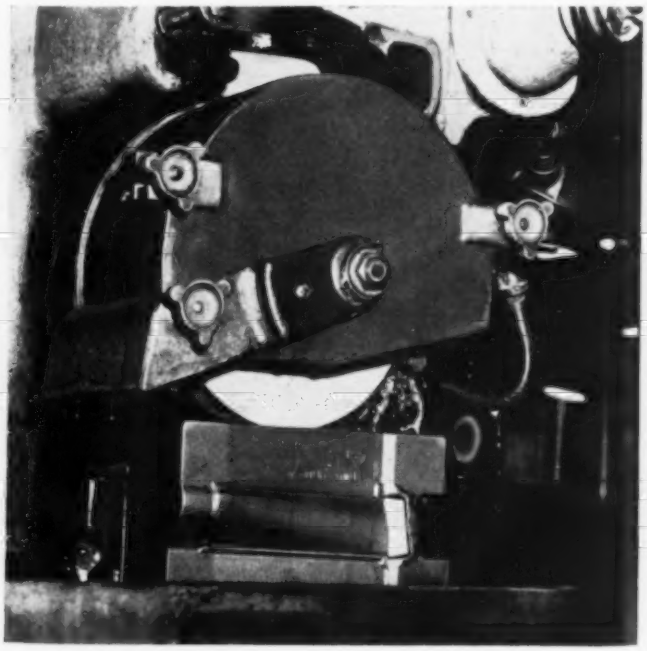
The nature of the material being worked, its hardness, and its sensitivity to heat largely determine the type of abrasive as well as grit size and wheel hardness to use.

For surface grinding cast iron, chilled iron, non ferrous metals and most non-metallic materials the conventional gray silicon carbide abrasive has long been standard. For grinding the hard cemented carbides, light green silicon carbide is usually preferred.

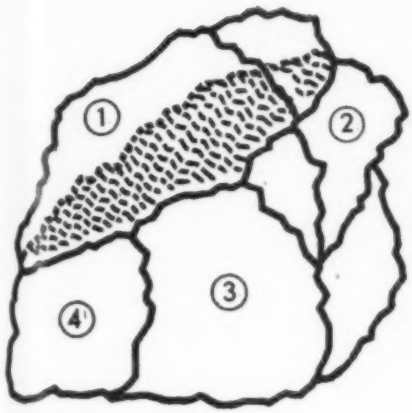
In surface grinding cemented carbide tools and dies, where accuracy and finish rather than stock removal are the chief requirements, diamond abrasive wheels, of the straight type on reciprocating



WET SURFACE GRINDING on a section of a plastic mold die gains extra economy through the use of semi-friable special aluminum oxide abrasive.



OPEN STRUCTURE (12) was recommended for surface grinding this forging die, because of the relatively large area of grinding contact. Wet grinding.



TYPICAL ABRASIVE GRAIN particle showing probable cleavage lines which will form new sharp cutting edges as the grain breaks down in use. This process of breakdown and fracturing of the grains occurs under the pressure of actual working conditions. This fracturing comes to an end when each abrasive grain can no longer function as a good cutting tool. At this point, it is desired that the grains will pull out of the bond and expose new, fresh abrasive grains to the cutting action.

OF THE FIVE TYPES of bond—vitrified, silicate, shellac, resinoid, and rubber—vitrified bond is used for over 75 percent of grinding wheels. Inherent porosity and strength of these wheels give high stock removal. The purpose of the bond, whatever the type, is to hold the abrasive grains, or grits, in place in the wheel firmly enough to accomplish the cutting action, yet with sufficient friability to break down at the right time and reveal more sharp points for good cutting action. The bond accomplishes this by what

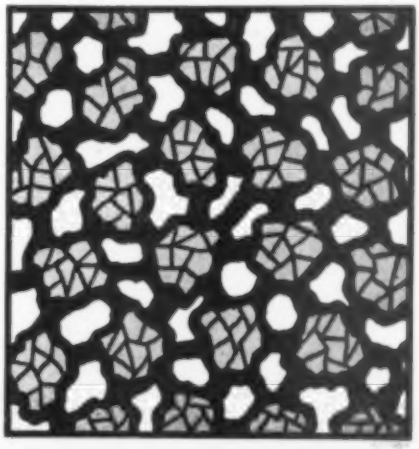
are called "posts"—the connecting bond matter holding the grits in position. Shown above and at the right are, respectively, a wheel with grits held by weak posts, and one with grits held by strong posts. Depending upon the type of bond used, it is the amount of bonding material which determines the relative hardness or softness of the wheel. To standardize this for wheel selection, manufacturers label their wheels from soft to hard with the letters A to Z.

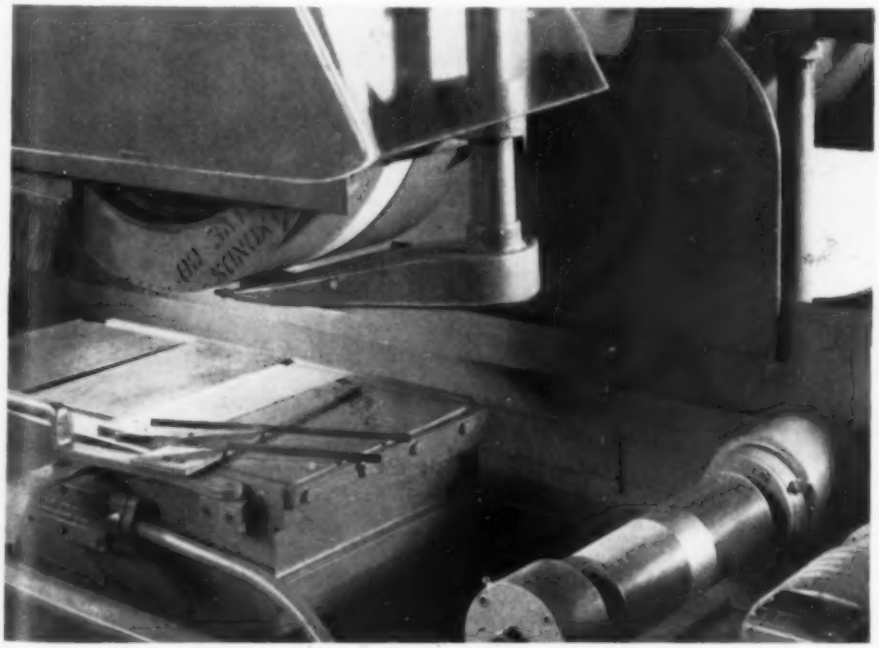
tables, are economical. It has become standard practice to use diamond wheels of the cylinder type on vertical spindle machines for precision grinding flat surfaces and optical and glass work as well.

Factors Influencing Selection

In selecting proper grain and grade of wheel within a particular classification, the following factors should be taken into account: material to be ground, width of surface presented to the wheel, amount of stock to be removed, accuracy and finish demanded on the job.

The material to be ground determines the kind of abrasive to use. In surface grinding high-speed steel and hardened steels in general, aluminum oxide abrasive, with its exceptional point endurance, is ideally suited and should be the first choice in solid wheels where

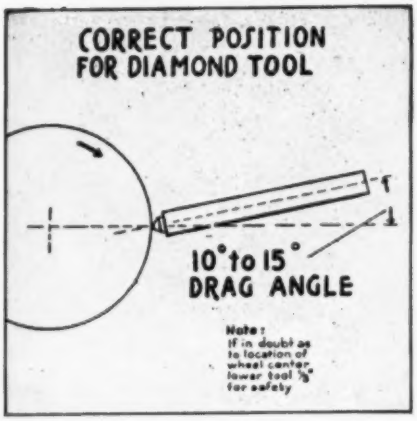




TRUFORM GRINDING (crush form grinding) of margin stop and letter space rack bars for typewriters. Wheel is 9½" in width and the rack tooth form is crushed into the wheel. Fixture consists of a magnetic chuck with a mechanical clamping device.

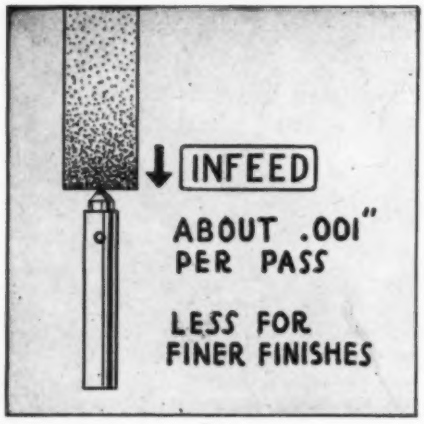
TWO ILLUSTRATIONS ABOVE show wheels with dense spacing and open spacing of the grits. This, in contrast to the amount of bond, which is referred to as hardness, is the structure of the wheel, and is determined by the porosity or the number and size of voids within its make-up. Wheel manufacturers control the size and number of grits, the amount of bond and thickness of bond posts, and the size and number of voids, thereby creating wheels of varying degrees of density or openness in structure.

CORRECT POSITION FOR THE DIAMOND TOOL


CORRECT POSITION
FOR DIAMOND TOOL
10° to 15°
DRAG ANGLE
Note:
If in doubt as to location of wheel center, lower tool ⅛" for safety

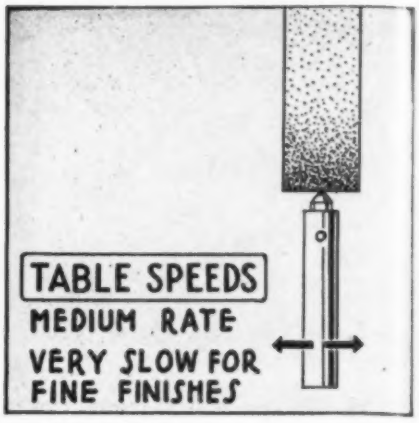
DIAMOND TOOL should be mounted at an angle to the wheel face, pointing in the same direction as the wheel is rotating. This "drag angle" should be between 10 and 15 degrees. Too much angle will grind away the metal holding the diamond. Too flat an angle will wear flat spots on the diamond.

PROPER DEPTH OF CUT TO TAKE IN DRESSING WHEEL



TAKE LIGHT CUTS, about .001 at each pass, until wheel is perfectly round. This should leave a satisfactory surface for rough grinding. For finer finishes, reduce wheel infeed and for the finest finishes, take several passes with the diamond across the wheel with no infeed. Deep cuts are apt to leave diamond marks.

TRAVERSE SPEED OF DIAMOND ACROSS THE WHEEL



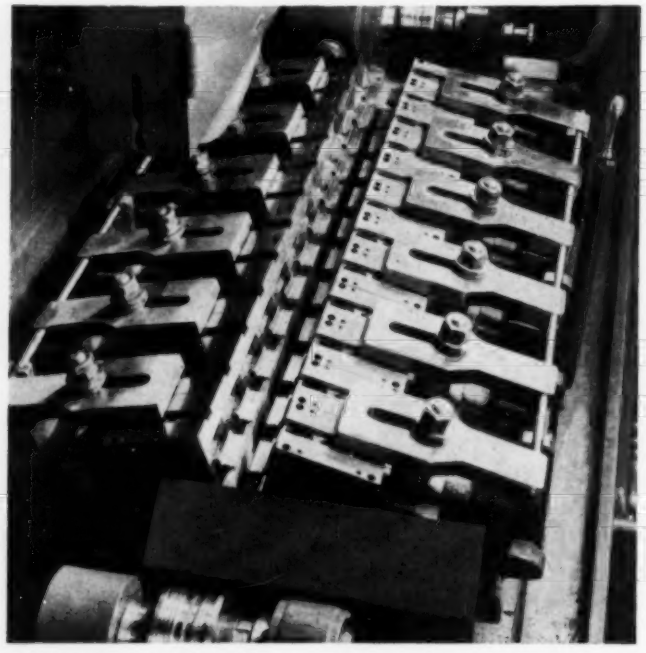
TRAVERSE SPEED of diamond depends on grain and grade of wheel and finish desired. A slow traverse gives a high finish, but if too slow will glaze the wheel. Fast traverse leaves a free cutting wheel. Employ medium traverse generally for rough grinding.

stock removal is a prime factor.

The nature of the work material, its relative hardness and susceptibility to cracking, influences the choice of grit size and wheel hardness. Hard materials resist the penetration of the abrasive grains and cause them to dull quickly. Therefore, as the hardness of the material increases, use a softer grade of wheel, and in some instances finer grit, which permit the grains to break away from the bond as they become dull. Vitrified wheels normally used in surface grinding range from E to J in order of increasing hardness.

Of great importance in the case of vertical spindle machines, the width of grinding surface is worth considering in horizontal spindle surface grinders also. The surface to be considered with vertical spindle machines is the chuckload of workpieces. As the area of contact is increased, correspondingly softer and more friable wheels are required to insure a cool cutting action. Within limits, the same is true of wheels on horizontal machines—as the area of contact increases, softer wheels or an adjustment of feeds and speeds to achieve the effect of softness are required.

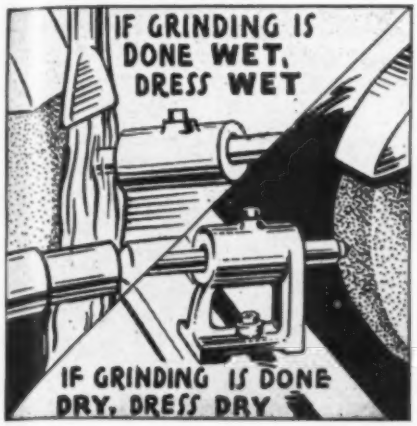
As a general rule, the coarser the grain size, the faster will be



TRUFORMING PROCESS (crush form grinding) grinds jet turbine blades. Machine is arranged with a multiple station mechanically operated holding fixture. View shows the line-up principle of using two crushing rolls, the one in the upper right-hand corner being the working roll, and the one in the lower left-hand corner being the reference roll for reconditioning the working roll.

FINISH GRINDING the sliding table for a cylindrical grinder within tolerance of .0002 for straightness and parallelism. In any grinding operation, the amount of stock to be removed has direct bearing on grinding cost. Hence it is economic to design parts to fit the production method, eliminating unnecessary thicknesses of metal and bringing the work to the grinder with as little metal to remove as is feasible.

HOW DRESS WHEELS—
WET OR DRY?

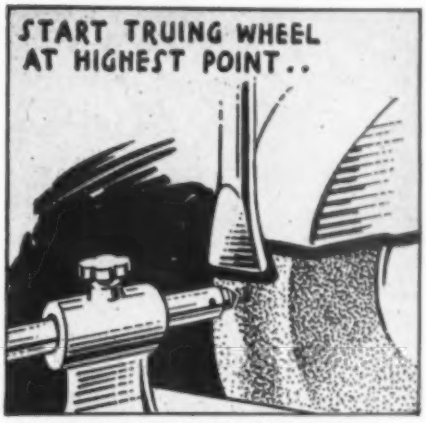


DRESS UNDER THE SAME CONDITIONS as when grinding. Grinding wet, dress wet. Dry grinding should get dry dressing. If dressing wet, use plenty of coolant and turn it directly on the diamond point before starting the dressing operation. If dry, allow diamond to cool between passes.

TURN THE DIAMOND
FREQUENTLY

DIAMOND DRESSERS ARE USEFUL only when sharp. Unless you turn the diamond, say a quarter turn every few passes, the diamond will develop a flat spot, become dull, and crush the abrasive grains rather than sharpening them, producing a dull wheel.

BRING DIAMOND TO THE
HIGH POINT OF WHEEL



DIAMOND SHOULD BE BROUGHT to the high point of the wheel. The grinding face usually wears more on the edges, leaving a high spot in the center. To prevent excessive penetration and damage to the diamond, contact the wheel at the high point before traversing. For high finish however, do not contact the wheel without traversing, as the diamond can leave a mark on the wheel which would be transferred to the work.

the rate of stock removal. Coarser wheels are capable of greater penetration, have more chip clearance, can take heavier cuts. However, if the material to be ground is hardened steel or cemented carbide which are difficult to penetrate, then a slightly finer rather than coarser grit will generally prove faster cutting because of the greater number of cutting points presented to the work at the point of contact.

The better the finish required, the finer must be the grit size. However, on modern production surface grinders with heavy spindle construction, and great rigidity, a good commercial finish can be obtained with wheels of from coarse to medium grits. Instead of using separate wheels for finishing and roughing as two distinct operations, machine operators often find they can use a single, medium grit wheel,

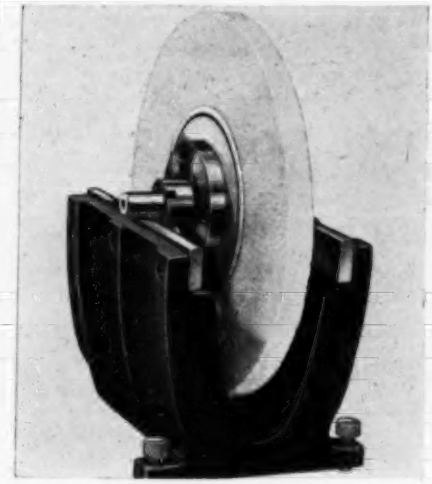
WHAT SIZE DIAMOND TO USE

THIS DEPENDS largely on the size, grit size, and grade or hardness of the wheel. Wheels below 12" diameter, use diamonds ½ to 1 carat. Wheels 12 to 18 inches, use diamonds 1-1½ carats. Harder grades of wheels require larger diamonds.

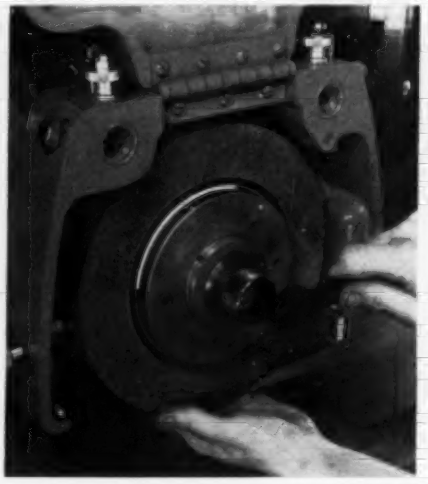
WET GRINDING a large number of similar pieces held on magnetic chuck. Grinder here shown with two wheels, one the conventional horizontal spindle, and the other a vertical spindle cup so mounted that either or both wheels might be used in grinding the same piece. In some situations, one wheel can perform rough grinding and the other the finishing cuts.

HOW TO USE THE
MECHANICAL DRESSER

WHEN USED for offhand grinding, the mechanical dresser should be supported on the work rest or some other rigid point.



ONE TYPE of wheel balancing fixture. Wheel should be rough trued, then balanced, then finish-trued in balance on the machine.



WHEELS WHICH HAVE BEEN TRUED and balanced should be removed when possible with complete assembly so that they may be returned to the machine for a repeat run or re-use and be in balance.

DIAMOND TRUING and angle dressing device mounted on angle block set up positioned on magnetic chuck.

dressing it coarse for roughing and then dressing it fine for finishing cuts, and taking very light cuts on the last few passes.

It is worth noting, too, that dry surface grinding requires softer wheels than may be used successfully with wet grinding. Skilled operators can even obtain variations in this by varying the wheel speed, for example, in through-the-wheel coolant applications in wet grinding, so as to get the optimum performance from their wheel on the particular job.

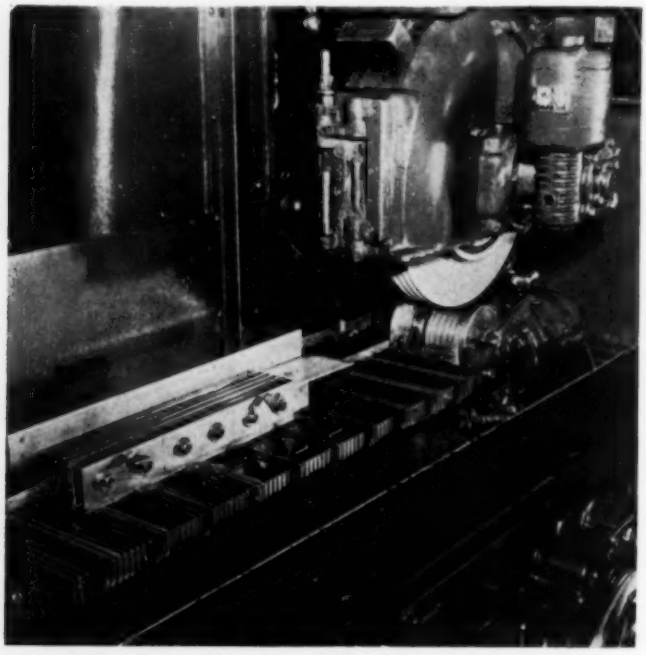
Wheel Preparation

Forming, truing, and dressing of wheels are actions which in some cases may overlap, and which—at least to some operators—may seem to mean the same thing. However:

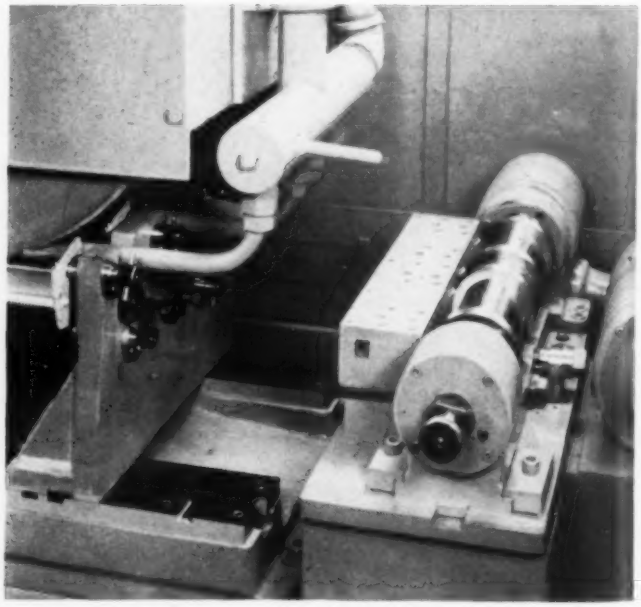
Forming the wheel refers specifically to the profile given the wheel which is then imparted in reverse or negative form to the work. This ranges from a straight line profile to impart a flat surface to the work, to whatever complexity of grooves and ridges may be imparted to the wheel in order to create a specific shape in the work.

Truing the wheel refers specifically to shaping the cutting surface of the wheel so that it runs true in relationship to the axis of the wheel spindle. Thus a simple straight line profile to grind a flat surface must run parallel to the spindle. With formed wheels having an irregularly-shaped profile, a "base-line" at the same point in the cross section must be made to run similarly parallel to the spindle.

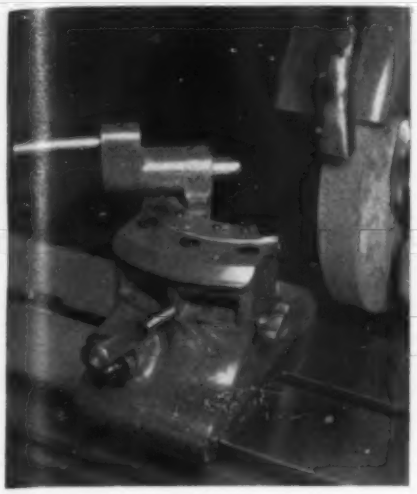
Dressing the wheel refers specifi-



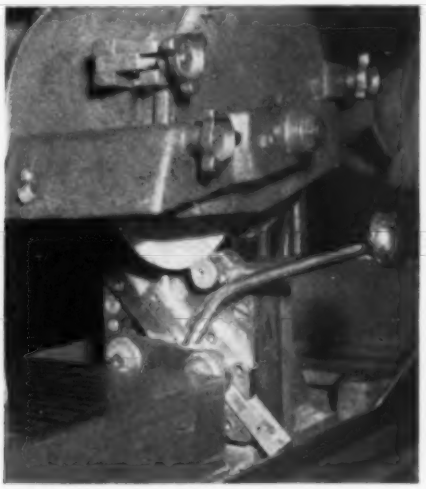
HARDENED HIGH-SPEED facing tools are formed with ease in crush-grinding process held to a machining tolerance of .0005. The jig holds 12 tools across and 3 end-to-end, or 36 per load. Finish, with a 220 grit wheel, is between 15 and 20 R.M.S.



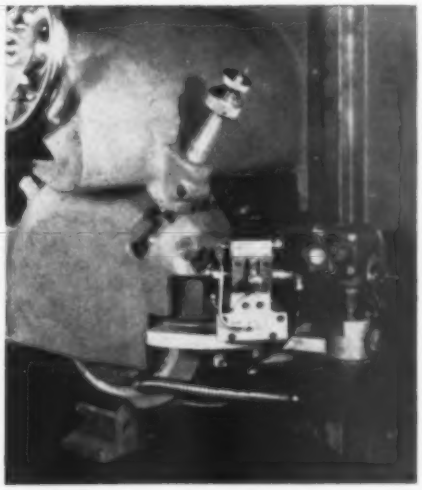
MULTIPLE GRINDING OF BALL RACES in anti-friction typewriter carriages. The machine is equipped with four 20" x 3/4" x 8" grinding wheels, mounted on a single wheel arbor. Four pieces are ground simultaneously. The crushing device has a shave tool attachment permitting the use of soft mild steel crusher rolls in which the form is actually shaved with four shaving tools mounted directly on the crushing fixture.



RADIAL TRUING DEVICE, shown here on cylindrical grinder, may be used on other grinders as well.



DEVICE USED for truing V-face on wheel of surface grinder.



HYDRAULIC ADJUSTABLE double angle dressing device is permanently mounted on grinding wheel housing.

cally to "sharpening its teeth", or to the process of cleaning up a loaded or glazed wheel and bringing new and sharp abrasive grains to the surface. Necessarily, in the dressing process, "truing"—or "untruing"—automatically takes place, as the dressing cuts taken in the face of the wheel by the dressing tool must affect the truth of the wheel one way or the other.

Thus in initially setting up a wheel, it is placed on the machine and rough-trued, then balanced, and then replaced on the machine and finish-trued, so that the last operation may constitute both truing and dressing in one step.

Forming Methods

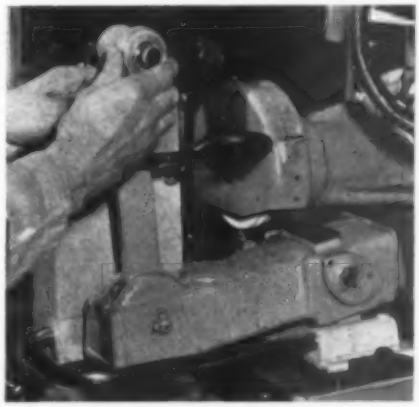
Forming wheels is primarily done by two methods, either with a single diamond point, or with crush rolls of some sort. Crush rolls used are either power driven or idlers. In the first instance, the power driven roll pushes the grinding wheel which is idling on its shaft. Idler crush rolls are pushed by the grinding wheel which is powered; some of these have built-in braking action to slow their speed in relation to the grinding wheels.

Forming wheels with diamond points is usually done by following a template of some sort so that the proper profile is achieved in the face of the wheel. Probably the most accurate of these devices are those which use over-size templates so that the operator guiding the diamond point is working at a 3 to 1 ratio, using some form of pantograph device to scale down the movement at the point where the diamond is shaping the wheel.

Either with such templates, or with crush rolls, wheels are both dressed and trued from time to time to restore both their running truth and their cutting surface while retaining the desired profile.

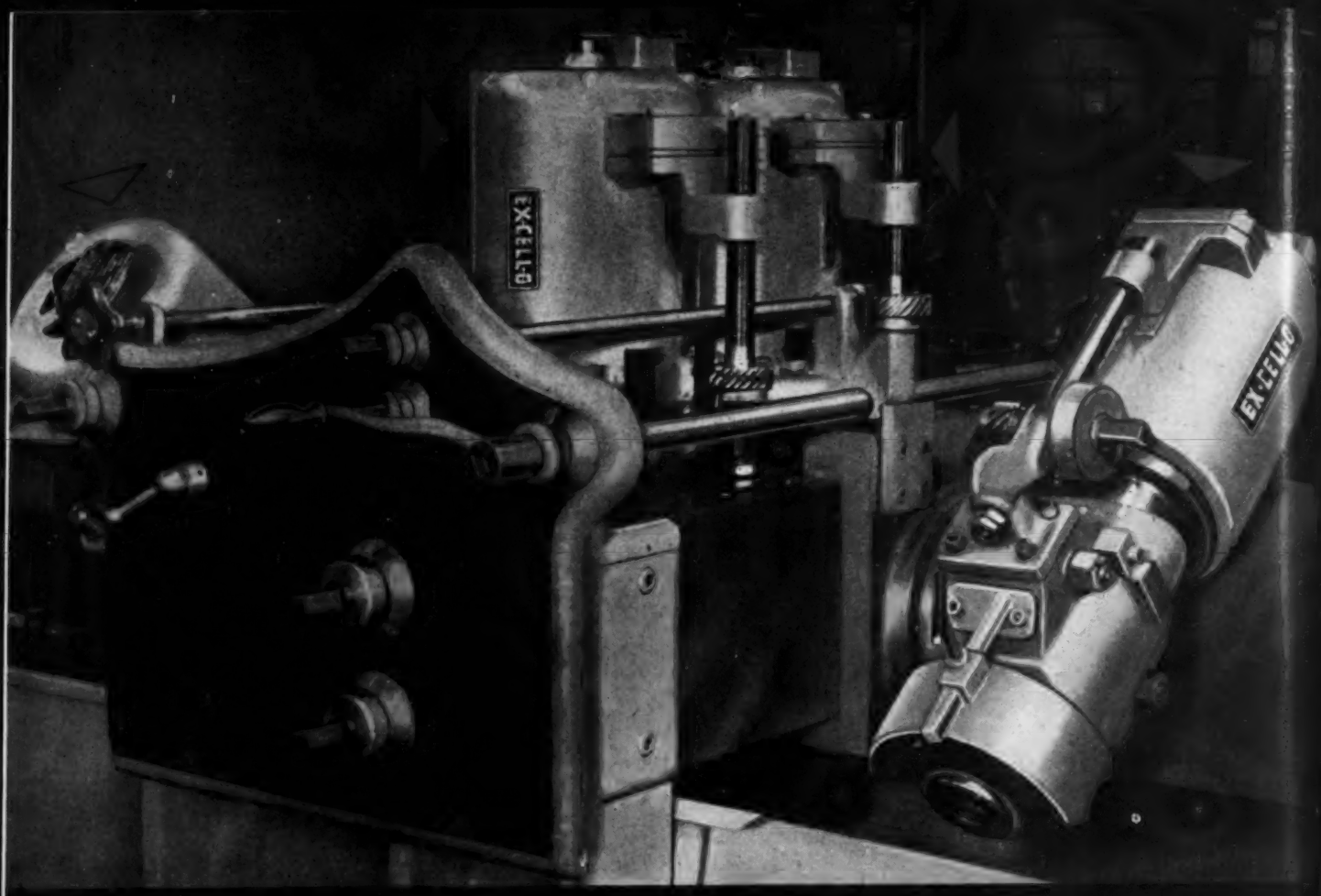
• • •

End of part 4.
Part 5 will appear next month.



PANTOGRAPHIC TYPE truing device on surface grinder follows oversize template in guiding diamond point.

MANY SMALL STAMPINGS require the grinding of contact surfaces. Parts being ground are code bar levers for typewriters being ground on a Truforming machine (crush form grinding). Parts are held in a mechanical magnetic flux bar. Two rows of parts are ground simultaneously. Small parts such as this require bench loading in the work holding fixture, so two fixtures are utilized for production purposes—one mounted on the machine during the grinding cycle and the other being bench loaded by the operator. Production is 1000 pieces per hour. Stock removal is approximately .010" with a 16 microinch surface finish. Parts are ground to full depth with a single pass under the grinding wheel. The coolant used is thread grinding oil.



This Idea Multiplied Production by Two...

EX-CELL-O SPINDLES— AN INGENIOUS APPLICATION

A machinery builder in Kalamazoo, Michigan was faced with the problem of finish grinding both flat and angular dovetail ways on the column, knee and table of his vertical milling machines. Surface lengths varied from 9" to 24"; tolerances on flat and parallel measure had to be within .001" in 24". Workpieces were gray iron sand castings.

Conventional way to do the job—an oscillating surface grinder to work each dovetail separately. Production men thought they could improve on convention. They built up their own machine from an old planer bed, added a bridge to support four Ex-Cell-O Precision Spindles and retained the standard planer feed.

The result: grinding both sides of four dovetail surfaces in one-pass planer fashion for a saving of roughly 50 percent in per unit cost. Perhaps you too have an operation which could be performed more economically by an Ex-Cell-O Spindle; or perhaps you simply want to use the most versatile, dependable and long-lived spindle money can buy. In either case, you'll want to get in touch with your nearby Ex-Cell-O Representative, or contact Ex-Cell-O direct.

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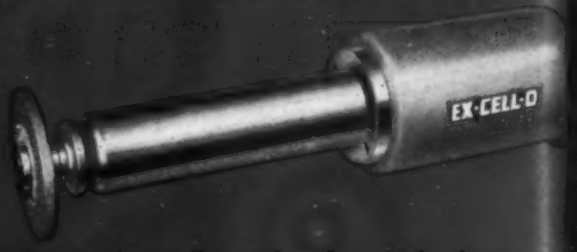
57-23

Above, four standard Ex-Cell-O Precision Grinding Spindles are utilized to grind four surfaces of machine ways in one pass.



Standard, totally enclosed motorized surface grinder spindle is rated one horsepower at 3600 rpm. Also available in a range of higher horsepower.

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EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

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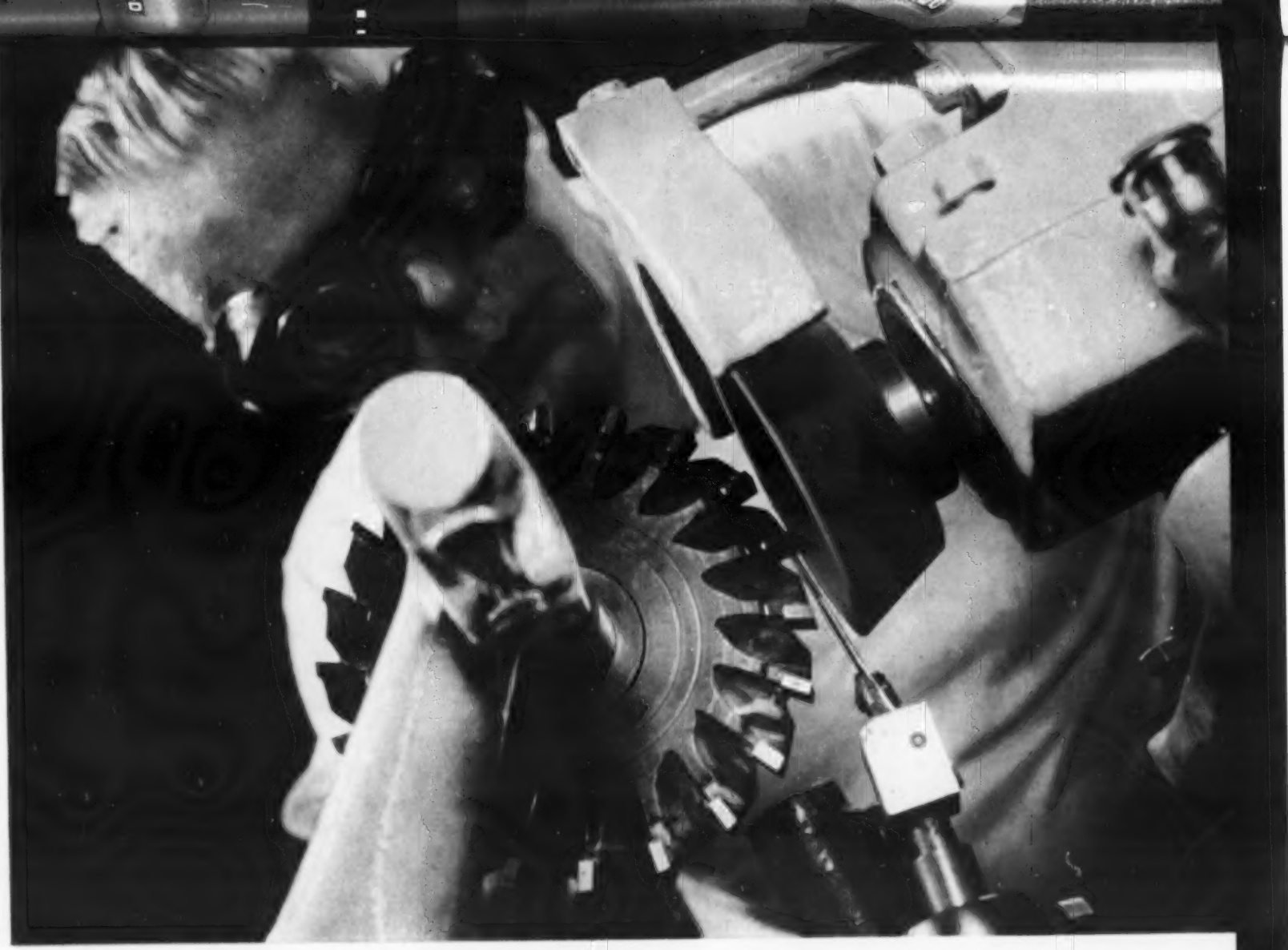
IMPORTANT: For your convenience this sheet is perforated. Tear it

IMPORTANT: For your convenience this sheet is perforated. Tear it out and "buck-slip" it to the proper man in your plant.

"GREEN GRIT" Silicon Carbide Wheels by Carborundum have been developed especially for preliminary roughing operations on cemented carbide tools. You'll find complete technical data on the back of this page.



Ask the man from **CARBORUNDUM** REGISTERED TRADE MARK **BONDED ABRASIVES DIVISION**

Also makers of a complete line of Coated Abrasives and Abrasive Grain

ATTENTION TOOL ROOM FOREMAN: Turn the page and see the Product Performance Report written especially for you.

Product Performance Report

ROUGH GRINDING WITH "GREEN GRIT"

Operation

Rough grind large carbide inserts.

Project

Select a wheel to grind carbide at a fast production rate without checking or cracking the carbide.

Results

Green Grit silicon carbide vitrified wheels are able to remove large areas of tungsten carbide in a short time with a burn free, check free finish.

Typical cutting performance shows that green grit wheels in one minute—

a) Ground .020" from a 1"x 1" carbide insert.

b) Ground .020" from eight 5/8"x 3/16" carbide inserts.

The carbide was free from burn, check and cracks after the grind.

Satisfactory finish grinds were produced at an increase of 30% in production time.

Note

Carborundum, leader in abrasive techniques, backs up its products with trained sales representatives, a staff of competent field engineers and an abrasive engineering laboratory ... all available to you to put more sense in your abrasive dollar.

Here is another in the series of Product Performance Reports being released by the Bonded Abrasives Division of The Carborundum Company. A color photograph of this actual operation is shown on the back of this page.

• *Ask your local distributor... or the man from*

CARBORUNDUM
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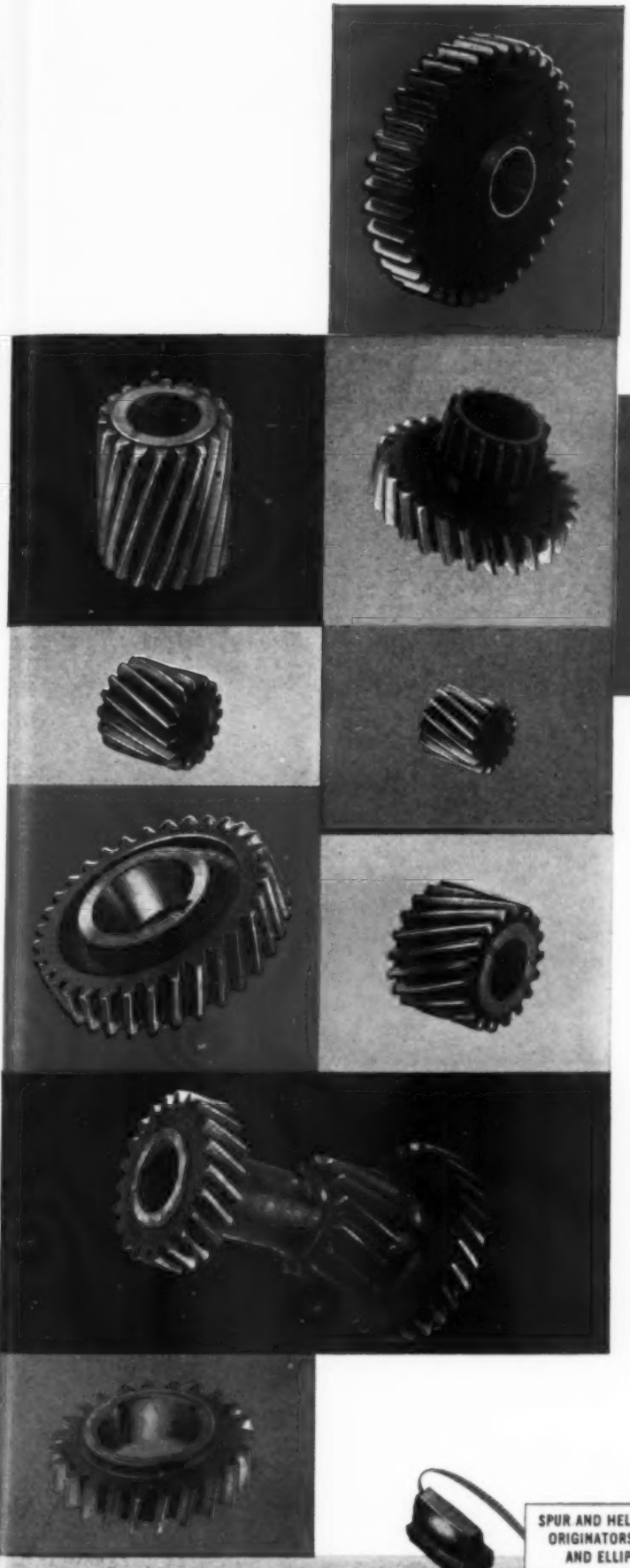

GEAR TOOTH NICKS and "HICKIES"

HONING IS THE LOW-COST WAY OF SILENCING THEM

You can hone the average automotive transmission gear in from 15 to 60 seconds. This single operation gets rid of all the noisy nicks and hickies that are so troublesome and tedious to deal with in any other way.

But that's not all. Red Ring honing also improves over-all surface finish—down to 2-4 microinches if necessary.

The initial pass under the honing tool is an effective inspection procedure in that it immediately reveals any distortions that may exist in tooth profile, spacing and pitch diameter runout. When such distortions are not excessive, honing corrects them.

If you want to reduce the cost of silencing noisy gears (1″ to 12″ PD), write for Bulletin H 57-2.

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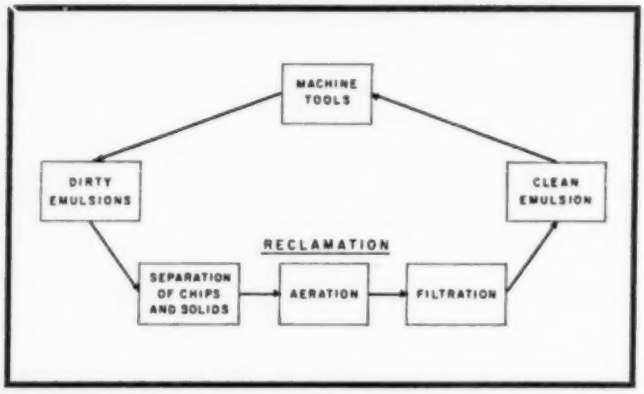
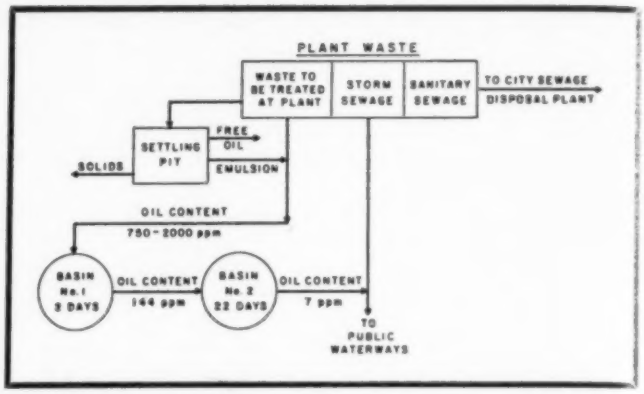


STEPS INVOLVED in keeping emulsions clean for continuous use.



A PHYSICAL MEANS of handling plant wastes containing soluble oil emulsions.

How to Dispose of Soluble Coolants

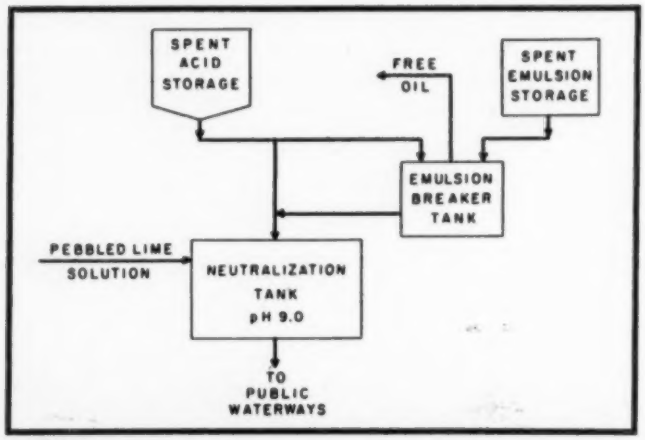
Increasing pollution of public waters is a matter of grave concern for American industry. Cities, states and the Federal Government are tightening their laws on industrial waste disposal. Here's what to do with spent soluble oil emulsions, which have been something of a problem.

by **R. K. Gould** and **W. F. Ball**
Research and Technical Dept.
The Texas Company

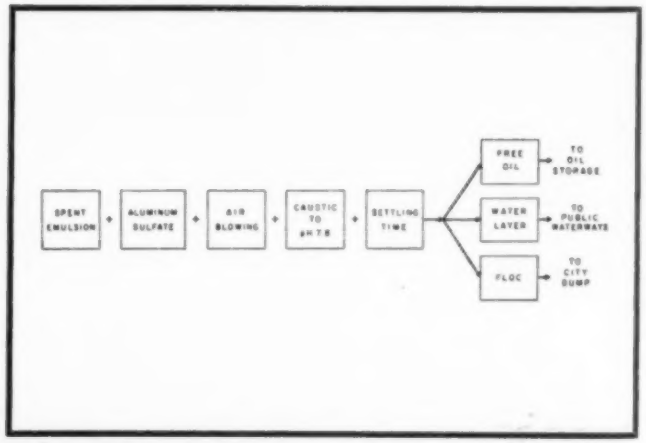
● The pollution of public waters has become a matter of great general concern and laws regulating the quantity and quality of waste material routed to rivers, lakes and streams are becoming increasingly more rigid. The disposal of industrial waste has always been more or less a serious problem, the magnitude of which varies from plant to plant, depending upon the nature and amount of material that must be discarded. However, in certain areas at least, the problem is now becoming critical. The oil content of industrial waste streams is receiving special attention, and maximum allowable concentrations of oil continue to be drastically reduced. For example, one industrial city now requires that the daily average amount of any grease or oil in the overall waste stream from a given plant must not exceed 25 ppm, and the amount for any one day must not exceed 100 ppm.

In many plants, a large portion of the oil in their waste streams results from the inclusion of spent soluble oil emulsions. This complicates the disposal problem, since most consumers of soluble oils have little opportunity to learn about their composition and hence are more or less at a loss to decide on the best means for handling the spent emulsion. Actually, soluble oils

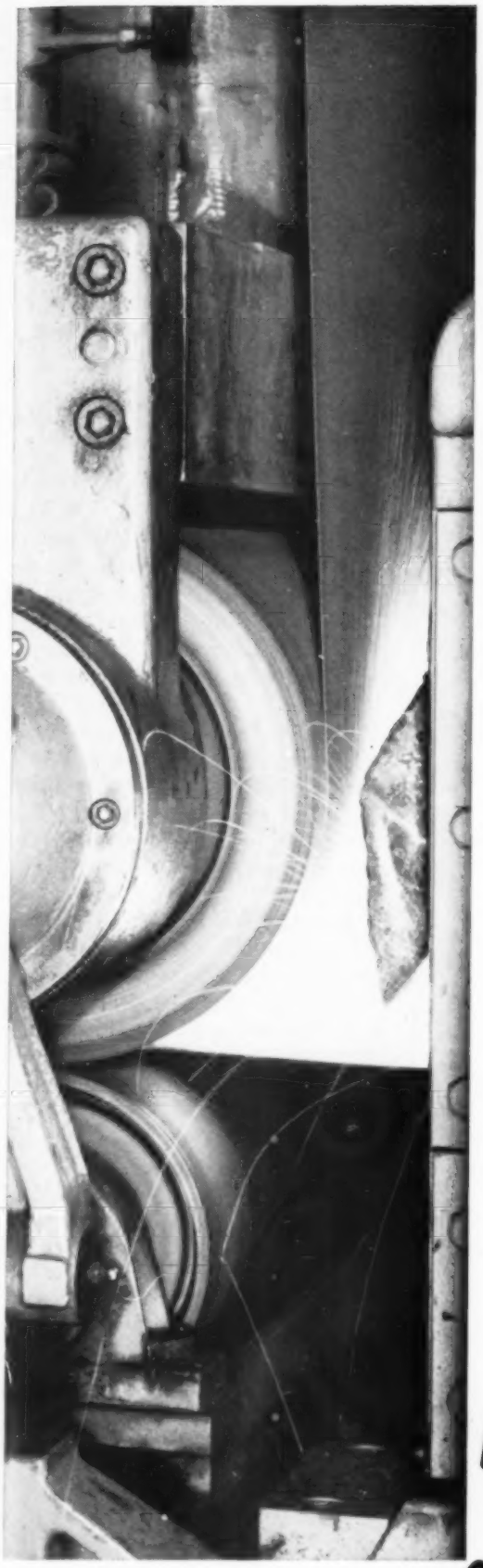
(*Continued page* 56)



METHOD OF TREATING spent soluble oil emulsions and spent acid.



BATCH METHOD of treating spent soluble oil emulsions with aluminum sulfate and caustic.



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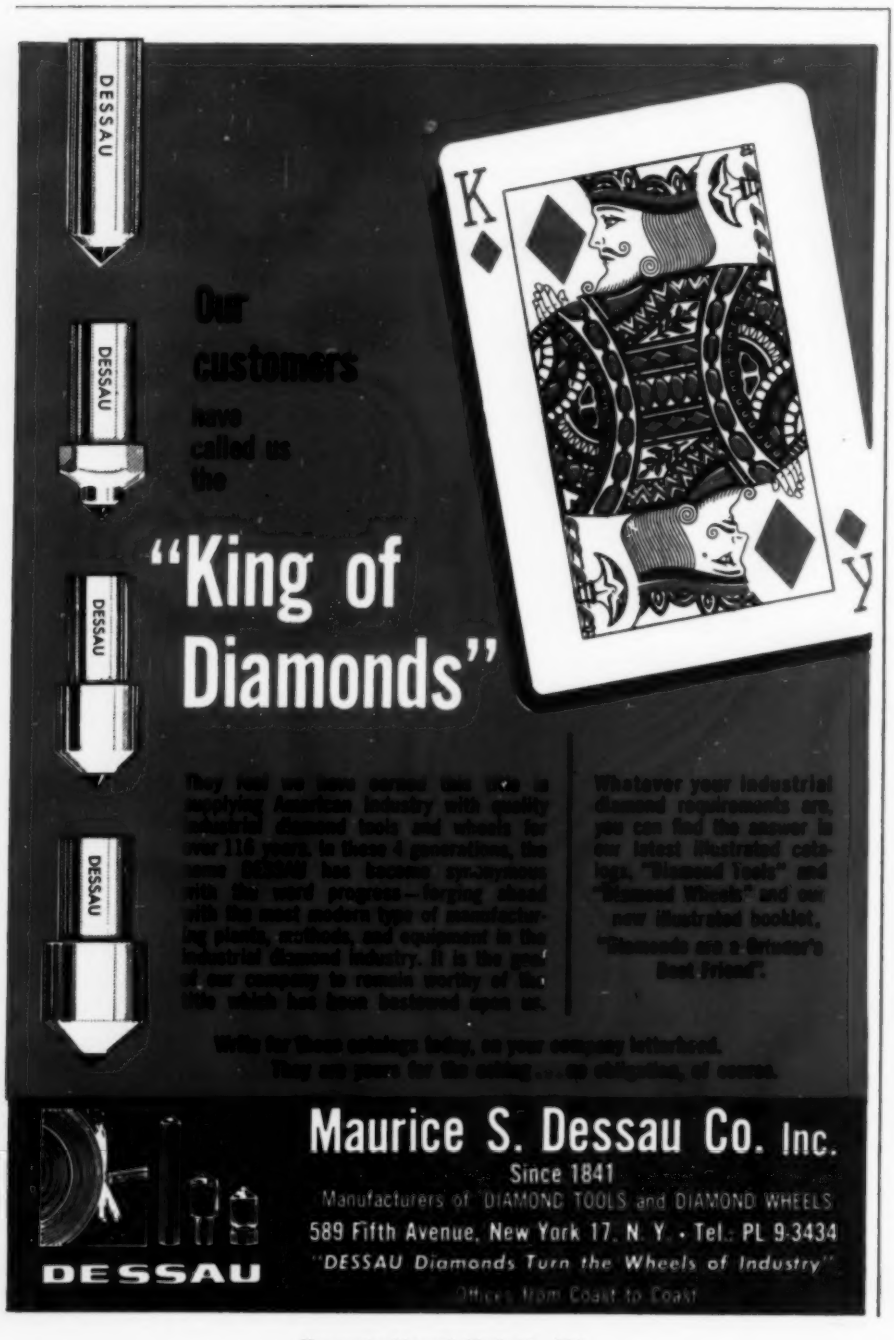
vary over wide ranges of properties and compositions, and the emulsions prepared therefrom vary equally as widely in their stability characteristics or the ease with which they can be broken. In some instances, spent soluble oil emulsions are handled apart from the rest of the industrial waste. In other instances, such segregation is not or cannot be done. This complicates the problem since the overall waste stream will be an everchanging, complex mixture containing coolants of all types, cutting oils, lubricating oils, chemicals, dirt and other contaminating materials.

One thing certain is that the disposal of industrial waste is a problem involving too many factors and variables to be solved by any one stock scheme or procedure. There is a great variety of methods which can be and are being used. A method ideally suited for handling the waste at one particular plant may be neither economical nor effective at another location. Consequently, the handling of industrial waste must be considered as a specific problem by each individual plant concerned. Production is of prime importance in any plant, of course, and the handling of industrial waste must interfere with this as little as possible.

Reduce Contamination

Before even considering the type of disposal facilities to be employed, a concerted effort should be made to prevent tramp oil, from leaking machines or floor washings, from getting into the overall waste stream. It is much easier to dispose of used oils before, rather than after, they get into the waste stream. Anything that can be done in this regard will, in most cases, ease the load on the treating facilities. The overall economy of such preventive maintenance has been proved over and over again.

Perhaps the first step in planning the actual disposal facilities to be employed should be a consideration of the possibility of segregating the over-all waste stream so that the quantity of material which must be given special attention can be reduced to an absolute minimum. For example, some plants find it convenient to divide their sewage into three separate streams, as follows: (1) a storm sewage stream containing, among other things, cooling water, and roofing and yard drainages, all of which can be routed directly to the public waterways; (2) a sanitary sewage stream containing the effluent from washrooms, cafeterias, and chemical laboratories, which is transmitted directly to the city sewage treatment plant; and (3) a stream containing all other wastes, including spent soluble oil emulsions. This latter stream will usually require special handling to reduce the concentration of undesirable components before it can be allowed to join the storm sewage stream and proceed to the public waterways. In some cases it may even be ad-



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visable to subdivide this third stream still further so that the spent soluble oil emulsions can be handled by themselves. In any event, anything that can be done to reduce the amount of material that must actually be treated will be highly desirable. Every plant faced with a waste disposal problem should consider taking whatever steps they can to reduce this quantity.

Handling Spent Emulsions

The particular method to be used for handling that portion of the overall waste material which requires special treatment will depend to a great extent upon both the geographical space limitations and the overall amount of material to be treated. Simple lagooning can be employed successfully in most cases if sufficient space is available. More elaborate skimmers and separators become necessary to speed up oil separation and water clarification as the ratio of the available space to the amount of material to be treated decreases. When lagooning cannot be used, chemical treatment of some sort is almost mandatory. In cases where the volume of waste material to be treated is exceptionally large and the treating space very small, special equipment can be used in conjunction with chemical treatment.

Some procedures and methods currently being employed by industry to handle spent soluble oil emulsions and wastes containing spent emulsions are outlined briefly in the following sections. These are not to be regarded as complete or detailed descriptions but are intended only to serve as guides and to suggest general approaches that may be considered for any plant where waste disposal is a problem. Modifications can readily be developed by the particular plant concerned to adopt any one of these general schemes to its own specific needs.

Reclamation

Often through careful and controlled handling, it should be possible to maintain the condition of soluble oil emulsions in such a state that they need never be discarded, thereby eliminating the problems associated with their disposal. Obviously, a number of factors are involved in determining the relative merits and economics either of keeping the emulsion in such good condition that it never has to be removed from service, or of allowing the emulsion to become spent and subsequently handling its disposal so as to conform to legal requirements. Such factors include, among others, the nature of the machining operations, the quantity of emulsion in use, the amount of contamination and whether this contamination is inherent in the machining operation itself, or whether it is of external origin. Of all the factors to be considered, perhaps the contamination element is the most important. If the emulsion is to be kept indefinitely, contamination must be reduced to an absolute minimum. Not only does excessive contamination complicate the handling necessary to keep the emulsion in condition for continuous use, but also contamination can eventually promote the breakdown or separation of an emulsion. Leak-

(Continued page 58)

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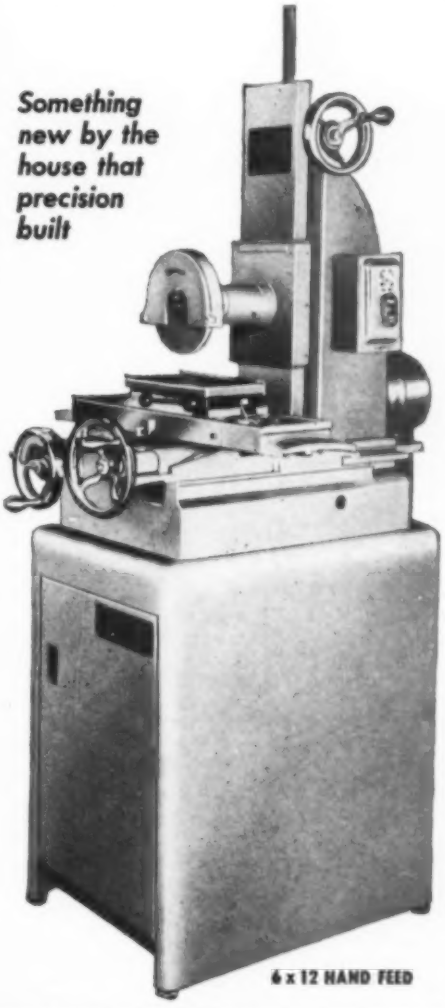

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Soluble Coolant . . .

age of the machine tool lubricating oil is one of the most common and likewise undesirable sources of contamination of a soluble oil emulsion. This is most prevalent in old machine tools which have been in service for a long time and is probably the most difficult source of contamination to eliminate. Contamination resulting from bad housekeeping practices can usually be prevented more easily.

Generally, three main steps are involved in the reclamation of spent soluble oil emulsions, namely, (1) separation of metal chips and other solid particles, (2) aeration, and (3) filtration. Separation of solid particles can be accomplished by gravity settling, although the use of magnetic separators may be helpful in some cases. If the emulsion has been used for grinding operations, there undoubtedly will be some grinding dirt which will float on the surface of the emulsion. This can be skimmed from the surface in the settling stage. Aeration of the emulsion will bring to the surface any tramp or non-emulsified oil, which can then be removed. Aeration will also be effective in killing any growth of bacteria which may have developed and which, if allowed to persist, will eventually cause the emulsion to break. Filtration may not always be necessary, but it is recommended to remove the last traces of any finely divided metal particles still present in the emulsion. There is a variety of filters available on the market which will do the job required without harming the emulsion itself.

A number of techniques can be visualized for performing the various steps involved, ranging from batchwise to continuous operation. The following is an example of a continuous scheme that might be employed in a large plant which uses a central system for distributing soluble oil emulsions.

The emulsions could be transferred from the individual machine tools to the treating area by means of suitable pipes, troughs or ditches, care being taken to avoid further contamination during transfer. As a precautionary measure, it is recommended that the ditches or troughs be covered. The emulsion then enters the bottom of a sump or settling basin for gravity separation of the solid particles. The hold-up time should be sufficient to permit complete separation of all the material that will settle out. Metal chips can be removed from the bottom of the sump by means of a mechanical conveyor. Any grinding dirt floating on the surface can be removed by directing a jet of air across the surface and blowing the dirt to one end where it can be picked up by the chip conveyor. The emulsion is then siphoned into a tank where it is aerated to bring to the surface any non-emulsified oil and also to destroy bacteria growth. The separated oil can be skimmed or over-flowed into a trough for subsequent handling. The clean emulsion is pumped through a suitable filter to a central tank from whence it is redistributed to the individual machines as needed.

Almost all strictly physical methods of handling spent soluble oil emulsions require a certain amount of land, and handling becomes more complex as the ratio of the quantity of emulsion to the area of available land increases. As men-

(Continued page 60)

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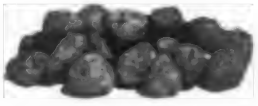

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Soluble Coolant . . .

tioned previously, the problem can be simplified to a degree by segregating the overall industrial waste stream, if possible, so that the quantity of waste material that must be given special attention is reduced to a minimum.

The theory involved in handling that portion of the waste which must be treated is relatively simple although the actual execution may be complex, depending upon the nature and amount of material to be handled. In principle, the waste may be transferred to an open area which serves as a detention basin and after due time the soluble oil emulsion will break. The oil will rise to the surface where it can be skimmed and the other impurities will either come to the surface with the oil or settle to the bottom. The hold-up time in the detention basin will have to be of sufficient length so that the water to be discarded will meet the required specifications of the particular locality.

In practice it is usually found advisable to route the spent soluble oil emulsions to a settling pit before transferring it to the detention basin. This is particularly true if the spent emulsion contains an appreciable quantity of metal chips or other solid material which, if allowed to accompany the waste to the detention basin, would gradually decrease the volume of the basin and eventually fill it up. The settling basin can be either a simple pit where solid particles can settle out and eventually be hauled to a dump, or it can be in the nature of an A.P.I. Separator which will remove not only the solid material but also any nonemulsified oil present.

As far as the detention basin or basins are concerned, the simplest case is one where the quantity of waste is so small in comparison to the volume of the basin that the waste material is simply transferred to the basin and allowed to remain there. In due time the water will evaporate and its ultimate disposition will then constitute no problem. Of course, in order to employ this particular modification there will have to be some sort of a balance between the waste input and the evaporation of the water.

In most cases, the simplified procedure can not be used because the amount of waste coming into the retention basin in a given period of time will greatly exceed the amount of water evaporated during the same interval. Hence, it will be necessary to remove clarified water from the basin. In some cases, the relative volume of waste to be handled and the volume of available land that can be used as a detention basin are such that the overall land can be used as a single detention basin, and the retention time will be sufficient to enable the clarified water to meet the necessary specifications. In other instances, the holdup time will be insufficient for this to occur, and in such cases it will be necessary to subdivide the land into two or more retention basins operating in series. For a given area of land, its efficiency as a retention basin for clarifying waste water increases, up to a point at least as the number of separate basins connected in series increases. • • •

To be continued next month. Several examples of disposal problems and their solutions will be given.

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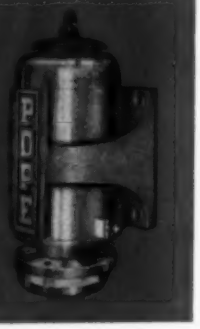

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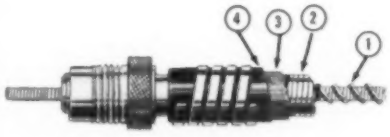

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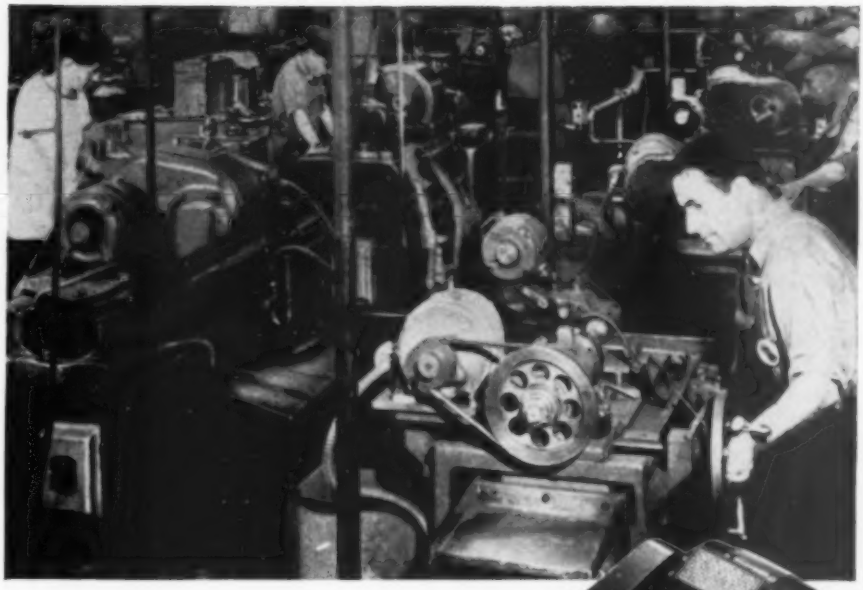

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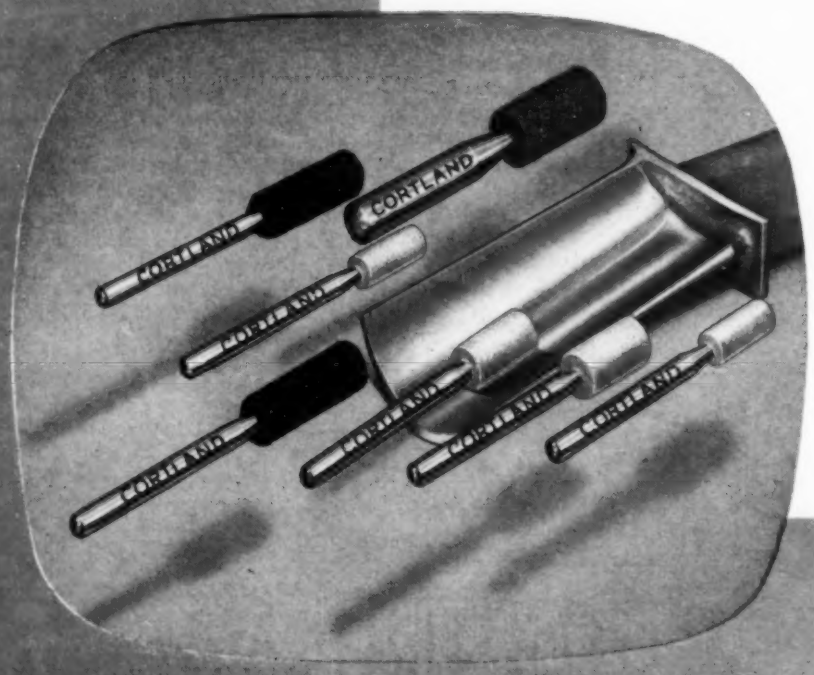
More and more manufacturers are coming to Cortland for mounted points in the new VA vitrified bond in a complete range of sizes and in specifications correct for their needs.

Why not let us serve you, too? We can prove our points: that Cortland Mounted Wheels and Points are of the highest quality, shop-tested to give you the greatest efficiency with economy. Our engineers have the technical knowledge plus the practical shop experience that you will find most helpful.



CORTLAND GRINDING WHEELS CORPORATION

Chester, Massachusetts

CORTLAND

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Worth Quoting

New Techniques

"New materials, new processes, and new techniques will continue to be developed for and introduced into manufacturing. This is absolutely necessary," says D. J. Davis, Ford Motor Company's manufacturing vice president.

Manufacturing planners in the automotive industry face the same "constant challenge" as stylists and product engineers in meeting consumer demands for frequent model design changes, longer and lower silhouettes and increased engine performance.

Davis said Ford manufacturing engineers are meeting the challenge by working closely with product engineers and stylists, by carefully planning operations long before production starts, and by constantly searching for and developing new manufacturing methods.

Davis spoke at an "executive night" dinner honoring Ford Motor Company, given by the Northern New Jersey chapter of the American Society of Tool Engineers.

"A complete and thorough planning job—far in advance of production—is essential to assure accomplishment of desired objectives, not only with respect to output, but also with respect to quality and cost," Davis said.

One tool used during the planning phase is the plastic prototype model, used for nearly every automotive part to visualize problems before thousands of hours are spent on detailed engineering, he explained.

"With the trend toward lower, longer and wider bodies, the use of heavier gage sheet metal has been necessary to maintain structural strength. This has presented several difficult problems that are being revolved by devising new welding techniques and equipment.

"Because of the demand for higher engine performance, metallurgists and manufacturing engineers have had to work out many new heat treatment methods for improving the strength-to-weight ratio of critical parts," he stated.

Davis also described several of the new Ford manufacturing developments which have concerned "every field of manufacturing in the company—from the production of iron and steel, through the fabrication of engine, chassis and body parts, to the painting and assembly of the finished vehicles." These included:

—Improved foundry practices, including automation and radioisotope controls, which have simplified operations, improved product quality and brought cleaner, better working conditions.

—Shell molding or precision casting of foundry products which

(Continued page 68)

Increased output from your carbide or ceramic cutting tools

HYPREZ

OSCILLATING LAPPING MACHINE

Records prove that the Hyprez lapping technique increases tool output per grind 200% to 700% — improves speed and feeds 50% to 400% — assures finer finishes and closer tolerances on end products. Now, your carbide and ceramic cutting tools and inserts can be lapped or refinished precisely and quickly.

OSCILLATING WHEELS ASSURE PRECISION

The Hyprez Finisher moves the variable-stroke lapping wheel across the edge of the tool while it is held stationary in a precisely controlled position. Protractors set exact angles for the horizontal and vertical planes; edges are straight; the geometry is not distorted. The top, lands and radii of the tool can be finished to 1 micro inch in two minutes or less.

HYPREZ DIAMOND COMPOUNDS

Charged with proper grades of Hyprez Diamond Compounds, the oscillating lapping wheels produce uniform, predictable finish—faster, scratch-free, precise.

For a demonstration or complete literature write Dept. LG-67

HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 S. DEARBORN ST., CHICAGO 5, ILL.

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HOW TO LAND A PRIZE CATCH

If you're casting about for ways to save money and increase your production, then you'll land a prize catch when you hook-on to CIMCOOL®—the radically new and different cutting fluid. Here are just three reasons why you'll want to net CIMCOOL Concentrate:

- **CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
- **CIMCOOL DOES A BETTER JOB** because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.
- **CIMCOOL IS CLEAN,** doesn't soil clothing or hands. It contains no skin irritants. It leaves no slippery film on shoes, floors, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

So, cast a line in the direction of your CIMCOOL Distributor. He'll give you complete information on CIMCOOL Concentrate— and the entire family of CIMCOOL Cutting Fluids. Or contact us direct. We'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

CIMCOOL CUTTING FLUIDS

CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Concentrates** — For jobs requiring oil-base cutting fluids. Added to mineral oils, they give economical mixes for higher speeds and feeds.

CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

®Trade Mark Reg. U.S. Pat. Off.

CIMCOOL Cutting Fluids *for* **100%** *of all metal cutting jobs*

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

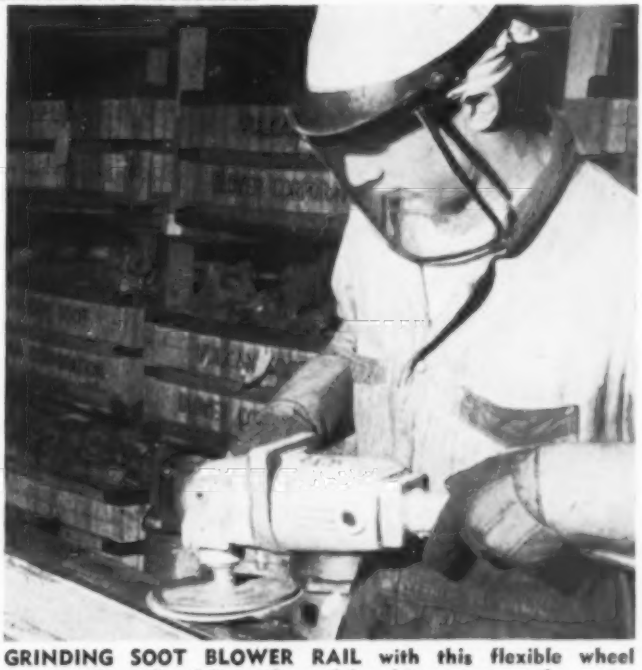
THE WRONG WAY to sharpen a chisel. The right tool for the right job applies to all grinding operations as to most other operations in the shop. Even though this workman wears goggles, safety shoes, and gloves, and has the wheel propped up on a 4 x 4, this is not only an unsafe act but one which will probably injure the tool being sharpened, rather than helping it.

EDGE AND SIDE GRINDING with a face-grinding cup wheel is another of the grinding practices which are definitely not recommended for good results and safe operation. Note, however, that the man is well equipped with protective clothing, safety shoes, full-cup goggles. Grinding on the edge like this sets up internal stresses in the wheel, tending to make it crack and fly apart.

GRINDING safely

by **Edmund Mottershead,** president
Mottershead Associates, Chicago

TAKING IT EASY on the job is not always the best practice, either. Safety glasses are not considered sufficient protection against flying particles in grinding operations. Grinding operation, however, is correctly performed with this wheel, which has grinding face on periphery rather than face, as do cup wheels. Use this type of wheel in situations where the flat face of the cup wheel will not work, rather than edge-grinding with the cup type.



GRINDING SOOT BLOWER RAIL with this flexible wheel is correctly and safely performed by this operator, who wears a full outfit of protective clothing, including face shield, gloves, safety shoes. The rubber backing of these flexible wheels permits adding a moderate amount of pressure to the action of the wheel. Care must be exercised so that the wheel does not buck and injure the surface of the work. Chief hazard here is a possible cut or burn from the edge of the wheel coming into contact with the worker's body.

Worth Quoting . . .

saves about 300,000 pounds of metal daily on Ford crankshafts alone.

—Cold-forming, another development which saves materials by "moving" metal rather than removing it. Parts are made to high accuracy and costly machining operations are eliminated. In producing 80,000 Ford piston pins a day, cold-forming saves 3,500 tons of metal a year.

—Ceramic cutting tools in one operation have increased tool life by 150 per cent compared to carbide tools, as well as enabling higher quality and increased production.

—The Ford-developed "building-block" concept for automation equipment would reduce high obsolescence costs which have plagued industry and facilitate incorporation of more frequent part design changes. Standardized components would enable rearrangement of machining lines like parts of an erector set.

"With proper planning and vision, new materials, new processes, and new techniques will continue to be developed for and introduced into manufacturing. This is absolutely necessary—not only for industrial progress, but also for national security—to protect our way of life," Davis concluded. •

Steel Capacity

Atomic power may bring with it the need for twice as much annual steel production, according to William Butler III of Lukens Steel Company.

". . . with the prospects opened by nuclear power, world steel capacity in twenty-five years will have reached 625 million tons." Present world capacity is estimated at 327 million tons.

"In this growth the United States is expected to hold its place as the world's leading producer with 40 percent of that capacity or 250 million tons.

"These are estimates," Mr. Butler cautioned, "and not guaranteed to be accurate to the last ton. But what does seem certain is that the steel industry will increasingly be called upon to produce better and better steel, special steels with special properties to meet special conditions.

"The growing importance of nuclear power both at home and abroad," Mr. Butler said, "holds certain clear implications for the steel industry:

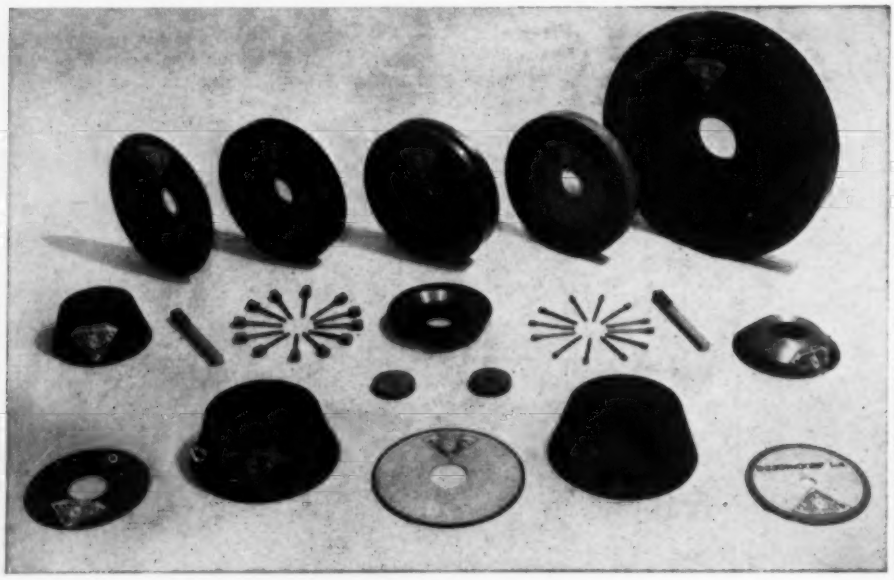
"First, it will create increased demand for the steels used in the mining of uranium and thorium ores.

"Second, it will create increased demand for the steels used in the construction of fissionable fuel processing plants where the mined ores are processed for subsequent use as fuel in atomic reactors.

"Third, it will obviously create increased demand for the types of steel used in reactor construction.

"Fourth, the growth of nuclear-fuel electric power will create increased demand for steels used in the recovery and safe disposal of radioactive waste materials.

"Fifth, but actually the result of the first four, the development of nuclear power inevitably will increase world demand for steel. The nations of the world hitherto underdeveloped and poor in other power resources will have an opportunity to grow thanks to the harnessed atom." •



ACE OF DIAMONDS brand diamond wheels frontrunners for excellence in American Industry. Assures you of the finest—maintained through modern facilities and rigid standards. ACE OF DIAMONDS a name to remember!!

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THE PAUL L. KUZMICK CO.

271-279 GROVE AVE., VERONA, N. J

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Johnson's major contribution to coolants fits today's high-speed production needs!

Coolants were just coolants for 50 years until Johnson's Wax Research developed formulations using *waxes* and *wax-type synthetics*. Johnson's Metalworking Fluids are as modern and efficient as your 1957 machine tools. They give you superior performance even on your toughest jobs — because Johnson's lubricates and cools under conditions where ordinary coolants fail because of extreme heat and pressure.

Use Johnson's on your fastest machines, with your hardest-to-machine metals, and compare results obtained with conventional coolants. In hundreds of shops across the country, Johnson's coolants for machining, cutting and grinding are reducing costs and increasing profits.

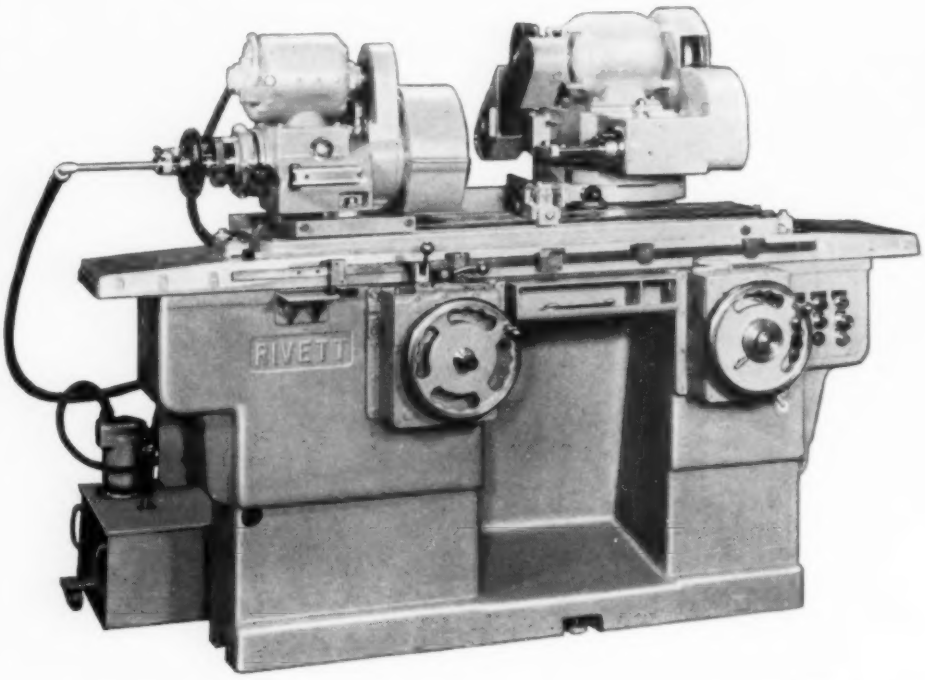
Your local Johnson's industrial distributor will be glad to set up an in-your-shop test of TL-131 — or any of the complete line of Johnson's Metalworking Fluids. Ask him about Johnson's money-back *Guarantee of Superior Performance* over ordinary coolants.

from
Johnson's Wax Research

S. C. Johnson & Son, Inc., Industrial Products Division, Dept. D-57, Racine, Wisconsin

"Johnson's" is a trademark of S. C. Johnson & Son, Inc.

Pictured below is Johnson's TL-131, one of a complete line of modern coolants for today's high-speed grinding.



Rivett 1024 Internal and Universal Grinder

You can keep this grinder always busy! Do any number of internal jobs and then switch over to external work. It has all the features of a true internal grinder — extra-long table moves sufficiently to left to permit plug gauging to 6″ depth without retracting wheelhead slide. External wheelhead is not hinged, but swivels a full 180° for quick conversion! Grinds any hole to 9″ diameter and externally to 12″ diameter.

No need for two special machines when you have a 1024! — particularly where grinding jobs are varied and production on any one run is limited!

RIVETT LATHE & GRINDER, INC.
Department GF-6 Brighton 35, Boston, Mass.

Get *all* the facts in Bulletin 1024B. Write for your copy today!

RIVETT
INTERNAL & UNIVERSAL GRINDERS

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grinding and finishing

Free Literature

Use the postpaid card opposite page 100 to receive your copy of any of the literature listed on these pages. Just circle the proper number on the card and mail it. We'll do the rest.

Diamond Cutter Dressing

6-page bulletin, "No Cycle Time Out for Wheel Dressing" describes cemented particle diamond cutter dressing, a new principle which permits full automation of production grinders. Developed as a substitute for crush forming where continuous maintenance of accurate wheel form was desired, the diamond cutters can be kept in contact with grinding wheel continuously or intermittently. With proper compensation for wheel wear, dressing and grinding can go on simultaneously. Procedure allows use of resinoid as well as vitrified type wheels. The many fine diamond particles of the cutter, set in a metal matrix, act like the teeth of a milling cutter in dressing the grinding wheel. Cutter life is said to be extremely long.

Jones & Lamson Machine Co., Springfield, Vt.

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Surface Gage

Catalog sheet describes surface gage designed for efficiency and accuracy in checking measurements on the surface plate with the use of an indicator and size blocks. Gage can be easily manipulated with one hand, leaving other hand free. Working range is from zero to 182 in height.

American Standard Co., Plantsville, Conn.

Use postpaid card. Circle No. 2

Centerless Grinder

Comprehensive brochure describing their new TG-12 Centerless Grinder is now offered by Royal Master, Inc. The TG-12 grinds a wide range of materials, including plastics, tungsten carbide, wood, glass, hard rubber and others. Brochure provides detailed description of mechanical features of grinder.

A highlight of the brochure is the illustrations of the various types of grinds that may be performed on the TG-12 . . . thrufeed, infeed, infeed taper, and combination grinds. Several photographs of each type are shown.

Royal Master, Inc., State Highway No. 23, Riverdale 1, N.J.

Use postpaid card. Circle No. 3

Grinding Wheels

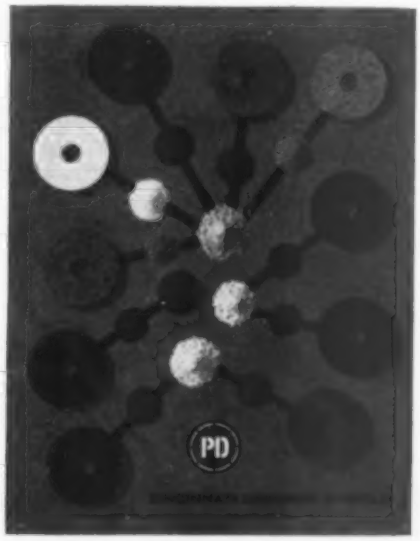
Comprehensive 36-page manual of Cincinnati "Positive Duplication" grinding wheels shows research which produces quality wheels, kinds and types of wheels made, wheel ingredients and manufacture. Discussed are grade selection faults, precision grinding faults, measurement of surface finish. Mounting of wheels, dressing methods, inspection, handling and storage, as well as safety, are given thorough treatment. Publication No. PG-320.

The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Use postpaid card. Circle No. 4

Diamond cutter dressing.

Royal Master centerless grinder.



Cincinnati grinding wheel manual.

Ultrasonic Gaging

8-page technical bulletin describes Vidigage, an ultrasonic resonance instrument used for fast, non-destructive testing. Bulletin V-200 gives complete data on advantages of using the instrument to measure thickness of metal, glass, and plastic from one side, and to find corrosion, laminar discontinuities, or other flaws. Included in accessory section is a description of newly developed Automation Converter, used in automatic sorting, high- and low-limit alarms, automatic acceptance and rejection, continuous recording, and other methods of automatic control.

Branson Instruments, Inc., Dept. GF, 37 Brown House Rd., Stamford, Conn.

Use postpaid card. Circle No. 5

A DIE CUT REPLICA of the Van Norman 2C centerless grinder, this pop-up folder includes highlights of the machine as well as a reply card which can be used to get complete details on the 2C grinder, a 13,000 lb. machine claimed to give the facilities of three centerless grinders. Van Norman Machine Co., Springfield, Mass.

Use postpaid card. Circle No. 6

High Temperature Brazing Alloys

Catalog SD-23 discusses the characteristics and physical properties of Nicrobraz brazing alloys. Characteristics in terms of shear strength, elongation, oxidation resistance, and tensile strength are illustrated by charts showing performance curves obtained in laboratory tests.

Flux for control of oxidation during torch or induction brazing at high temperatures, paste, rings, and Green Stop-Off for brazing alloy flow control are also presented. Unretouched photographs show typical Nicrobraz applications.

Stainless Processing Div., Wall Colmonoy Corp., 19345 John R., Detroit 3, Mich.

Use postpaid card. Circle No. 7

Reducing Vibration

Vibra-Mount felt is designed as a cushioning material on which to mount machinery which vibrates or precision instruments which must be protected from external vibration. It has high resiliency, low compression-set and long life.

"How to Reduce Vibration" is a booklet which tells how this felt gives up to 85% reduction in transmitted vibration. Available from the American Felt Co., Glenville, Conn.

Use postpaid card. Circle No. 8

Steel Platen Conveyors

Conveymatic Carrousel steel platen conveyors manufactured by Visi-trol Engineering Company, Detroit, are described in their new 4-page illustrated Bulletin No. C-1056. Relatively low in cost, they are adaptable for materials handling, automatic assembling, inspecting or light machining operations, featuring automatic indexing, adjustable dwell and controlled two-directional travel. Bulletin describes construction details, sizes, travel speeds, working heights, load capacities and a typical Conveymatic light-machining set-up.

Visi-trol Engineering Co., 9345 Hubbel, Detroit 28, Mich.

Use postpaid card. Circle No. 9

Zirconium Production

"More Zr Facts," a new bi-monthly brochure, features in its first issue a story on zirconium production processes at Carborundum Metals. Historical data is also given. Subsequent issues will deal with corrosion resistance, nuclear properties, physical and mechanical properties, analytical methods, and fabrication techniques.

Carborundum Metals Co., Akron, N.Y.

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Here's your spindle ready for reassembly. New super precision bearings from our complete stock of all types of spindle bearings are installed. We've cleaned and checked every part of this spindle for misalignment and flaws—It's ready to go back together for a series of exacting "run-in" tests to make certain the dirty, worn out spindle we received just hours ago is returned to you ready to perform as well or better than it did when the spindle was new!

Gentlemen:

I'd like to have complete information on your spindle repair service.

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NEW JERSEY: Camden • MARYLAND: Baltimore

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V-Drives

New 46-page Maurey V-Drive catalog is a convenient source of information on fractional horsepower V-Drives and drive parts and accessories. In the range of fractional to 10 horsepower, this well illustrated book presents easy-to-read descriptions and complete size data on the Maurey line of bushed type and fixed bore type cast iron and pressed steel V-pulleys, V-belts, refrigeration fans and fan pulleys, and V-drive accessories. A special page is devoted to Maurey interchangeable bushings. Other special pages show interesting action pictures of both Maurey fractional and multiple V-Drives. The final section of the book is a nine-page Engineering Data Section informative to the user who seeks to select the proper drive for his particular requirements. The new catalog is designated Form F-10.

Catalog Div., Maurey Mfg. Corp., 2915 South Wabash Ave., Chicago 16, Ill.

Use postpaid card. Circle No. 11

Automatic Assembly Machines

Brochure describes and illustrates variety of special assembly machines designed and built by Omer E. Robbins Company. In addition to showing machines, brochure contains assembly pictures and case histories, along with suggestions for taking the best advantage of automatic assembly operations. It points out that such operations can often be combined on the same machine with automatic selection, orientation, machining and inspection, saving time, manpower and floor space. Facilities for the design and construction of automatic assembly machines are also described in brochure.

Omer E. Robbins Co., 24800 Plymouth Rd., Detroit 39, Mich.

Use postpaid card. Circle No. 12

Brushes Clean Conveyor Belts

Rota-Master brushes are claimed to provide a practical, economical way to reduce maintenance, processing and production costs. They are of open face construction, and are made in 16", 18" and 24" face widths. Several units can be mounted on the same shaft to provide brushes of various widths. One of their principal uses is the cleaning of rubber or fabric conveyor belts. Other operations for which they are suited are material spreading, dust removal and metal finishing when used with abrasive compounds.

Folder covers brush specifications, horsepower and machinery requirements and a drawing illustrating method of setup.

The Osborn Mfg. Co., Cleveland 14, O.

Use postpaid card. Circle No. 13

If *your present method of sharpening small cutters . . .*

is SLOW, INACCURATE, COSTLY—

is GIVING POOR CUTTING EDGE AND FINISH—

is CAUSING RUN-OUT IN SHARPENED CUTTERS—

is CONSUMING TOO MUCH TIME CHANGING SETUPS—

is TYING UP A LARGE EXPENSIVE MACHINE FOR SMALL WORK—

YOU NEED A
CENTRA•POINT
CUTTER GRINDER

Centra•Point's 12 advanced features *really can* overcome all these problems by mechanically performing functions which are troublesome and time-consuming on standard grinders. For full details write today for Bulletin M-55.

Manufactured in Boston

END MILL CENTRA•POINT GRINDER ®

WILLIAM H. FIELD CO., INC.
SINCE 1880
331 Dorchester Ave., Boston 27, Mass.
Use postpaid card. Circle No. 236

Electrolytic Iron

Bulletin describing uses and properties of Vanderloy, the electrolytic iron, has been issued by the Van der Horst Corporation. Vanderloy is 99.9% pure iron—comparable to low carbon steel. Some of the uses to which it has been put by Van der Horst includes the following: to reclaim worn machine parts; to provide a magnetic surface on non-magnetic metals; to reclaim mis-machined parts; to protect soft or perishable metals and alloys—copper, aluminum, etc.; to electroform molds and dies; to reinforce fragile metal forms; to provide a surface with a high affinity for tinning.

Van der Horst Corp., Olean, N.Y.

Use postpaid card. Circle No. 14

Cold-Rolled Spring Steels

"Fact Book of Cold-Rolled Spring Steels" is a brief course of instruction on the whole subject of spring steel: its essential qualities; the various grades and what each is most commonly used for; how it is rolled, annealed, slit and filed, hardened and tempered, polished, colored, and inspected at the Wallace Barnes Steel Division. An authoritative technical discussion of hardness values, selection of analyses, and grain structure is followed by some practical hints on blanking and forming parts from spring steel, and subsequent hardening and tempering of these parts.

Associated Spring Corp., Bristol, Conn.

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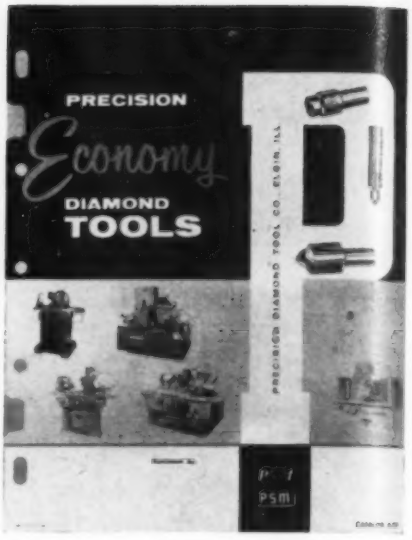


Diamond Tools

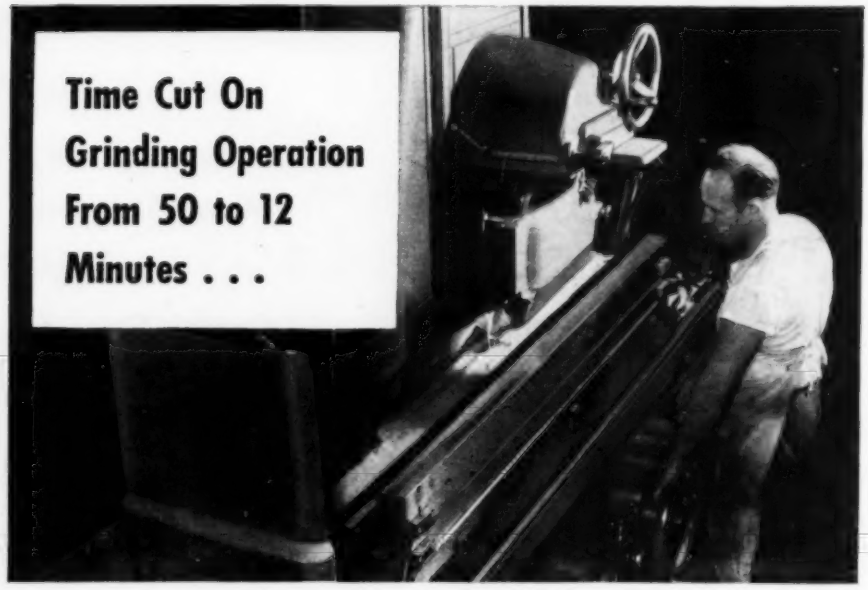
Catalog No. 4-57 features Economy Diamond Tools. Several new features will be of special interest to diamond users.

Diamond tools listed are all throw-away type dressers—they will not require resetting. This reduces cost of keeping records, reduces the inventory normally required. Catalog describes a patented steel matrix which holds small, elongated diamonds until they are completely used. Small, narrow contact area dresses wheels, offers many technical advantages.

Line includes single point dressers, multiple type and disc type.

Precision Diamond Tool Co., Box 274, Elgin, Ill.

Use postpaid card. Circle No. 16



With SUNDSTRAND "POWER-GRIP" Magnetic Chucks

Here's another good example of time savings with Sundstrand Magnetic Chucks. Two airplane flap tracks are held at one time for grinding on opposite faces of rail. Grinding stroke is 70 inches. Former time with conventional holding equipment was 50 minutes. With change to Sundstrand "Power-Grip" Chucks time is cut to 12 minutes . . . a savings of 38 minutes per part.

There's a good chance that you may be able to save considerable time in milling or grinding operations with Sundstrand "Power-Grip" Magnetic Chucks. Call in a Sundstrand Engineer. There is no obligation for this service.

Free Data is available on Sundstrand Clamping fixtures. Write today. Ask for bulletin 380-M.

SUNDSTRAND MAGNETIC POWER-GRIP

SUNDSTRAND
Magnetic - Pneumatic Products
Division of Sundstrand Machine Tool Co.
1020-9th ST. • ROCKFORD, ILLINOIS

Use postpaid card. Circle No. 237

Vibration Protection

A device that protects rotating and reciprocating machinery by anticipating any malfunction is described in a four page bulletin.

The device, known as the "Vibraswitch" malfunction detector, automatically shuts down protected equipment or sounds an alarm when normal operating vibration is exceeded. It is used for attended as well as unattended machinery. Bulletin covers in detail different models of the vibration detector, as used in exposed, hazardous and protected locations. Typical applications include the protection of pumps and motors, compressors, centrifuges, generating equipment, fans and blowers, gas and Diesel engines, and turbines.

Fielden Instrument Div., Robertshaw-Fulton Controls Co., 2920 North Fourth St., Philadelphia 33, Pa.

Use postpaid card. Circle No. 17

Electrospark Machining

Application of Method X process of electrospark machining to its new Style 243-6 Vertical Electrospark Machine is described in a Bulletin 43373 issued by Ex-Cell-O Corp. Detailed explanation of the Method X process is given as well as a working description, floor plan and specifications of the new machine. Incorporating the principles of the electrospark machining method in a mechanical unit, machine will pierce, drill, tap, trepan or sink a cavity into any material that is an electrical conductor. The unit is primarily intended for machining hard and tough metals, or cutting special shapes that would be difficult to produce by conventional machining.

Tools or electrodes for the Method X process are usually made from brass bar, tubing, or sheet stock; however, other metals that are electrical conductors can be also used.

Ex-Cell-O Corp., Detroit 32, Mich.

Use postpaid card. Circle No. 18

Pourable Cement

Evr-Tite comes in powdered cement form—mixes readily with water to a semi-fluid, easily pourable mixture. Anchor bolts may be set in 10 minutes, the manufacturer claims. Also recommended for repairing concrete floors.

The Monroe Co., Inc., Cleveland 6, O.

Use postpaid card. Circle No. 19

Metallizing Powder

Illustrated engineering data sheet (No. 53) discusses the use of Colmonoy C-250 metallizing powder for producing better crankshaft bearing surfaces. Literature analyzes the properties and characteristics of the powder and illustrates the essential steps in crankshaft preparation and application of the material. Also included is a detailed 11-step application procedure recommended by the manufacturer.

Wall Colmonoy Corp., 19345 John R Street, Detroit 3, Mich.

Use postpaid card. Circle No. 20

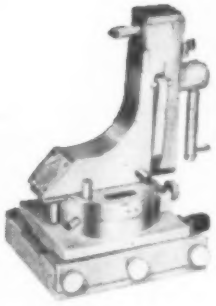
Conveyor Belts

Catalog 25-CB, covering conveyor and elevator belts, contains new style designations of general service heavy duty types of conveyor belts made with special strength members, gives tension ratings for vulcanized and metal splices, minimum recommended pulley diameters and minimum belt width for good troughing. Also included is a complete line of hot material belts for temperatures from 150° to 350°F and grain belts for oily and non-oily whole or cracked grains.

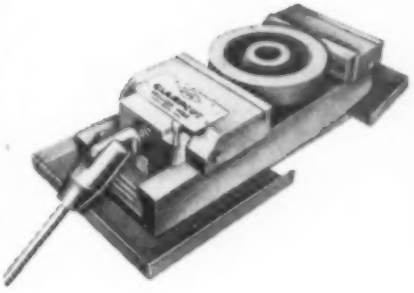
Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N.J.

Use postpaid card. Circle No. 21

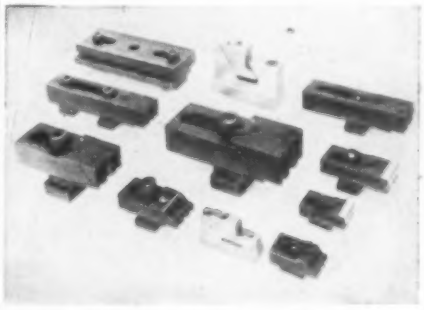
J&S DOWN-HOLDING DEVICES and WHEEL DRESSERS LEAD THE FIELD



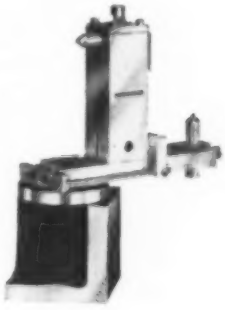
Fluidmotion Wheel Dressers—Dress two angles tangent to a radius, using ONE handle in one continuous motion. Operation is so fast and simple that beginners can use them. For all types cylindrical and surface grinders.



J & S Swivel Vise—The only hardened and ground swivel vise that mounts low, swivels, needs no pedestal. Patented down-holding clamping jaws give many times the holding power of an ordinary vise, yet only half the weight.



J & S All-Purpose Jaw Clamps — For any machine table or face plate. Five models—one adjusting screw has a holding force of 2½ tons on Small model, 12 tons on Jumbo model. Eliminate u-clamps, straps and fingers. No obstruction problems, no interference with measuring tool readings.



J & S Form-Master—Sturdy wheel dresser for shops with less frequent wheel dresser requirements. High quality, 100% dust-proof, it is capable of dressing any radii up to 12″ convex, up to 15″ concave.

Write for free literature and further information.

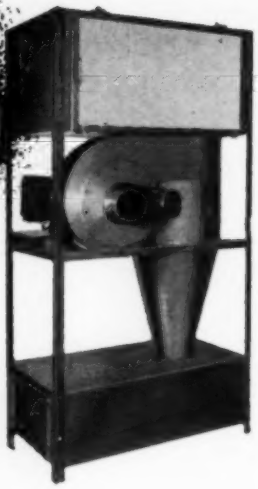
J&S TOOL CO. INC. — CLAMPCUT

J & S TOOL CO., INC. | 880 DORSA STREET LIVINGSTON, NEW JERSEY

Use postpaid card. Circle No. 238

EFFICIENT–LOW COST

Dust Collection



Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units; or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

DUSTKOP STOPS DUST

37 STANDARD MODELS TO CHOOSE FROM

• READY TO USE

Also a Complete Line of Mist Collectors

AGET MANUFACTURING COMPANY

1380 E. CHURCH ST. • ADRIAN, MICHIGAN

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LEA GRIPMASTER®

Industry's Abrasive

BONDING CEMENT

for Wheels and Belts

PRODUCTION TESTS SHOW 25% TO 35% INCREASE IN WHEEL OR BELT LIFE

LEA GRIPMASTER offers other values, too. For example, it sizes as well as bonds. Its single grade bonds effectively a wide range of grit sizes. It's more flexible.

We're not asking you to commit yourself blindly with a large order. In fact, we're offering you a generous free sample so that you can give a wheel or belt a good competitive work out. Just fill in and mail us the coupon below. The sample of GRIPMASTER will be in your hands in a few days.

LEA-MICHIGAN, INC.

14066 Stansbury Ave., Detroit 27, Michigan

(A member of the well known Lea Group of Finishing Specialists)

Lea-Michigan, Inc.
14066 Stansbury Ave.
Detroit 27, Mich.

☐ Please send us your free sample of GRIPMASTER.

☐ Please send us literature giving full details.

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Company_____

Address_____

GF-6-57

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HANCHETT

METAL SAW SHARPENER

for HOT or COLD CIRCULAR SAWS
Solid or Inserted Tooth Types

HEAVY DUTY – BALANCED DESIGN

Straight Line Grinding Wheel Feed Action – Smooth and Accurate

Wheel Head Adjustable for any Saw Tooth Angle Desired (Cam Action)

MODEL 572

- Grinding wheel speed is adjustable for wheel wear
- 100% anti friction bearings for smooth, trouble-free operation
- Accurate—simple stroke adjustment for both feed and lift cams
- Rugged construction for hard, heavy duty performance
- Heaviest stock removal at high production rate
- Grinding wheel head motor—two h.p. (belted type)
- Capacity—24" to 72" diameter saws (larger when required)
- Available—other sizes and types of machines to meet all saw requirements

HANCHETT MANUFACTURING COMPANY

World's Largest Manufacturers of Saw Sharpening and Knife Grinding Machinery

MAIN OFFICE: BIG RAPIDS, MICHIGAN

WEST COAST: PORTLAND 1, OREGON

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Grinding and Finishing

New Equipment and Materials

For further information on any of the products listed here, use the handy postpaid card opposite page 100.

Honing Machine for Small Diameter Work

Model No. 10A1 Vertical Honing Machine is one of four models developed by Barnes Drill Co. for manual or automatic honing of bores from ⅜" to 2" in diameter. These machines are designed with mechanical and pneumatic actuation, therefore eliminating hydraulic tank and piping.

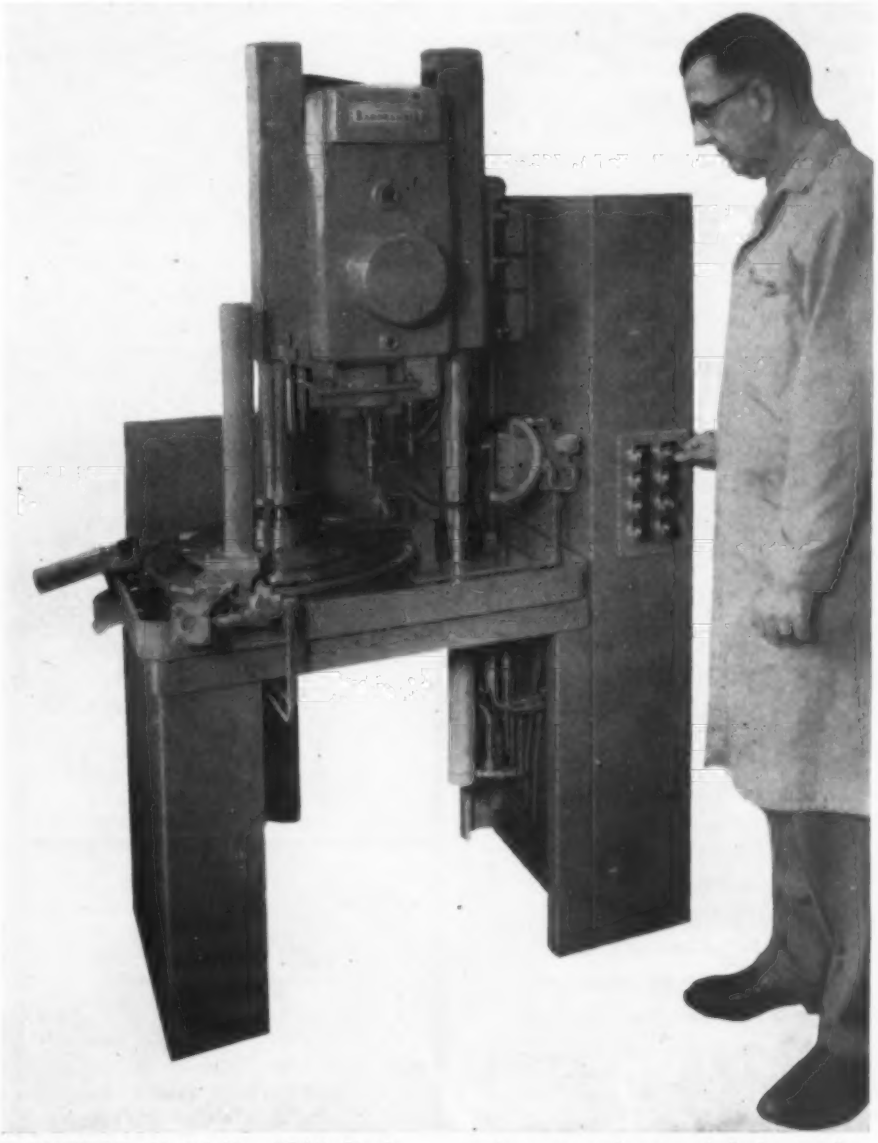
Compactness, versatility and simplicity were the prime considerations for design of this line. Compactness is indicated by the floor area which, including electrical panel, is only 32" x 45" to 42" x 63" for the largest model. Versatility is provided by design of a basic machine with provisions for adding automatic equipment such as a rotary indexing table, magazine feed, pregaging, bore-to-bore sizing by fluid, plugmatic sizing or time cycle, pneumatic hone expansion with automatic rapid expansion, feed and collapse, postgaging, sorting and ejection. Also provided is automatic shutdown for continuous error or when stones are worn. Simplicity is provided by an all mechanical reciprocation and rotation of head and spindle. On the manual models 10M1 and 15M2, the complete cycle is controlled by two limit switches. The automatic Models 10A1 and 15A2 require only four limit switches. The use of air in place of hydraulics and mechanical system has greatly reduced maintenance problems which could be experienced.

Design provides a double post arrangement with the spindle suspended in line between the posts, thus providing rigidity and accuracy. Use of the vertical spindle directs coolant flow away from moving parts at all points.

The line consists of four machines. Model 10A1 (shown) has a ⅜" to 1" inside diameter range with a 10" swing. The maximum spindle travel is 2½" with a 6" lift out stroke. Power is supplied by a ¾ HP motor. 10M1 has the same capacities but is furnished without the automatic attachments. The 15A2 and 15M2 have a ½" to 2" inside diameter range with a 15" swing. Maximum spindle travel is 6" with an 8" lift out stroke. These models are powered by a 2 HP motor.

Barnes Drill Co., 886 Chestnut St., Rockford, Illinois. •

Use postpaid card. Circle No. 101



BARNESDRIL Model No. 10A1 Single-Spindle Vertical Honing Machine with ¼" to 2" mechanical reciprocating strokes, pneumatic hone expansion, (6) station automatic rotary indexing mechanism, fluid automatic bore to bore sizing loading and ejection attachment, and centering and clamping attachment.

Oscillating Tool Lapper

Mirror finishing of carbide and other hard cutting tools is facilitated by use of a new tool finishing machine introduced by Engis Equipment Co., Chicago. The proven advantages of fine finishing of carbide tools are enhanced by this machine, which enables great accuracy to be obtained along with the low microinch surfaces.

Available in either bench or floor stand models, the new machine makes possible finishing of tools as they are held stationary, the oscillation of the wheel producing the required angles and tool geometry. Finishes of ½ to 6 microinches are said possible, using diamond lapping compound as the finishing medium. Instead of oscillating the edge of the tool across the face of a rotating wheel, the Hyprez Finisher moves the wheel across the edges of a stationary tool. Work tables can be accurately and quickly set to any angle within plus or minus 30°.

Oscillating lapping wheels of the Hyprez machine are made of Meehanite, precision machined for accuracy and balance. The oscillating action is said to be free from vibration. Oscillating stroke can be adjusted from zero to one inch, and direction of rotation can be reversed by a convenient switch. Wheels can be removed, reground, or interchanged.

Hyprez tool finisher has two lapping wheels, oscillating action.

Another feature of the machine in addition to the twin lapping wheels is a built-in polishing tool with interchangeable bobs.

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill. •

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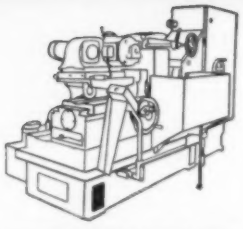
Production

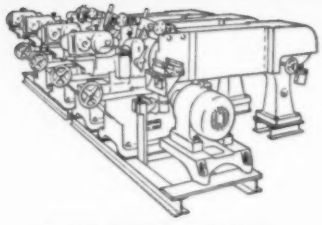
CENTERLESS GRINDING & FINISHING MACHINES

THERE'S A PRODUCTION MACHINE FOR EVERY PURPOSE

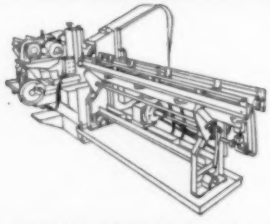
- ★ Heavy stock removal on Bars and Tubes
- ★ As low as 5 micro inch RMS surface finishes
- ★ Traverse direction reversible
- ★ Any diameter — any length
- ★ Production rates unlimited
- ★ Single or Tandem installations
- ★ Traverse speeds up to 100 FPM
- ★ Plunge cut or thru-feed
- ★ Shoulder Work, formed parts



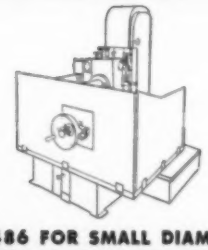
HEAVY DUTY TYPE 914
Write for Bulletin No. 14



HIGH SPEED TYPE 101
Write for Bulletin No. 16



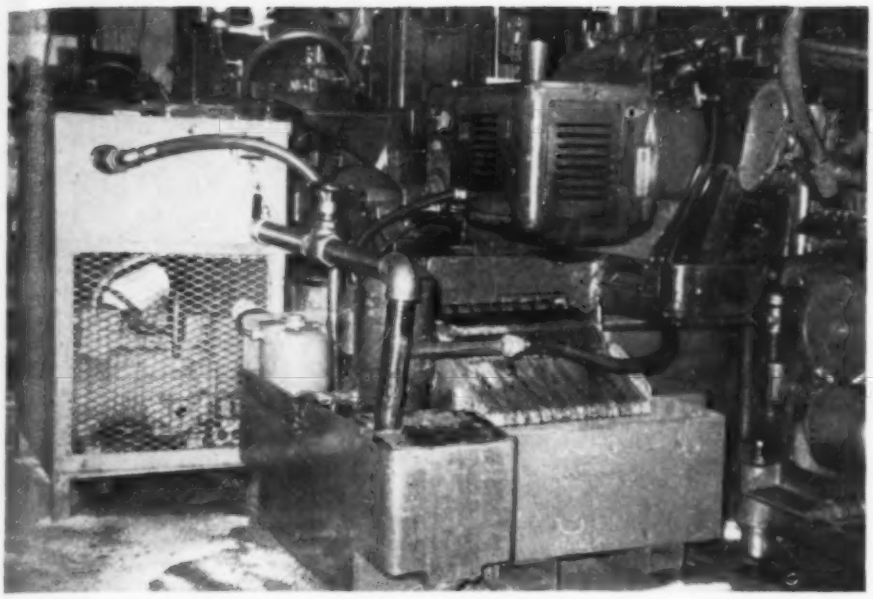
MEDIUM DUTY TYPE 614
Write for Bulletin No. 17



TYPE 486 FOR SMALL DIAMETERS
Write for Bulletin No. 19

PRODUCTION MACHINE CO. Greenfield, Mass., U.S.A.

Use postpaid card. Circle No. 242



Lundholm coolant chiller, left, in operation on this Landis centerless thread grinder increased wheel life and production both by 30%, lengthened time between wheel forming by 80%. Machine is used for grinding studs on a thrufeed basis.

Refrigeration Improves Coolant Performance

Use of coolant refrigeration equipment in the plant of a West Coast manufacturer has increased overall production and wheel life in centerless thread grinding operations. The plant manufactures studs which are threaded full length by throughfeed centerless grinding on a Landis machine. Range of sizes of the studs is from ½ to 2¼ inches in diameter and from 1½ to 18 inches long. They are used in construction, fabricating, petroleum, pipe line and shipbuilding industries.

Crush forming of the centerless grinder wheels is used, and thread grinding oil is the coolant. Prior to the installation of coolant chilling equipment, the oil heated up to a temperature of 170 to 180 degrees F in a matter of about five hours of normal grinding, depending on the size of the studs being ground. Starting in the morning at a temperature of 70 degrees F, the oil coolant reached this prohibitively high temperature, forcing the shutting down of the machine. The rate of oil flow is 30 gallons per minute, and the machine sump contains 85 gallons of oil.

To prevent this undue overheating of the grinding oil, a coolant chiller unit manufactured by Lundholm Mfg. Co. of Rockford, Ill., was installed on the machine.

Several benefits were realized right away. Wheel life increased 30 per cent, and overall production also increased 30 per cent. The period of time between wheel dressing by the crush method was increased by 80 per cent, thus saving on crush roll costs.

Other benefits of the chilled coolant were improvement in the cutting action of the wheel as reflected in the elimination of a loading condition that had been experienced.

For further information on liquid coolant chillers in a range of capacities for fully automatic operation, write Lundholm Mfg. Co., 1121 Charles St., Rockford, Ill. •

Use postpaid card. Circle No. 103

Flexible Shaft Machine

Wyzenbeek and Staff, Inc. announces the introduction of two larger models of their variable speed flexible shaft machines. They now have machines available from 1/3 to 1½ H.P. Changes in speed from 2000 to 7200 RPM can be made easily by simply turning a hand wheel. These machines have extra-light and easy-bending high speed flexible shafts designed for a sequence of operations in the finishing of stainless steel and other metals.

Wyzenbeek and Staff, Inc., 223 N. California Ave., Chicago 12, Ill.

Use postpaid card. Circle No. 104

COOLANT or GRINDING COMPOUND PROBLEMS?

here's your Solution

INTERNATIONAL REFINING & MFG. CO. ACCRUS EVANSTON, ILL. U.S.A.

NOW you can...

- produce low micro-finishes with 60 grit grinding wheels —EXCELUS MICRO FINISH Grinding Compound;
- accomplish deep draws without fractures or wrinkling — INTERNATIONAL DRAWING COMPOUNDS;
- hob gears without oily floors, undesirable working conditions—NEW ACCRUS;
- draw No. 40 B&S magnet wire at 5000 FPM trouble free—ACCRUS No. 4.

43 Years Old - BUT NOT Old Fashioned!

Our products are time tested and modernized to meet today's requirements.

Our field engineers work with industry, solving critical production problems through proper use of coolants, lubricants and drawing compounds.

What are your problems?

...Call on us!

INTERNATIONAL

Refining & Manufacturing Co.

1914 — 1957

EVANSTON ILLINOIS

Use postpaid card. Circle No. 243

Make accurate set-ups *faster* with this

25° Tilting Spindle

The STERLING Model "G-2" Universal Tool and Cutter Grinder provides this extra feature plus complete versatility and more capacity than comparable machines at *lower cost.*

Swing 10¾" over table, 27" between centers, 18" table travel with 8¼" cross feed. For complete details and specifications write for FREE Bulletin "G-2".

Grind 90° to 140°

Included Angle on *ALL DRILLS*, ⅛" to 2½"

No collets or chucks makes set-ups easy. Clearance gauge insures accurate, positive clearance angle. True conical grinding produces full clearance from center to outside. Write for FREE Bulletin "DV-1".

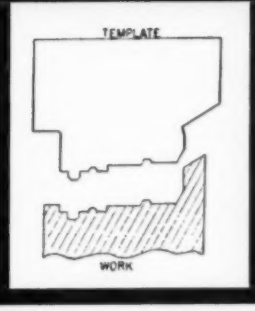
McDONOUGH MFG. CO.

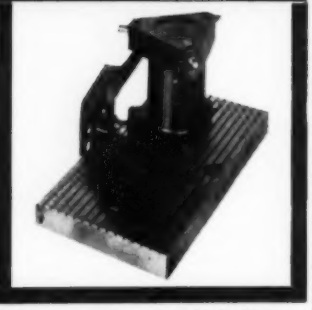
1522 GALLOWAY • EAU CLAIRE, WISC.

Use postpaid card. Circle No. 244

the Contour Rex RECTIFIER

NEW WAY TO PRECISION-FORM GRINDING WHEELS USING ONE TO ONE TEMPLATES and TOTALLY NEW RECTIFIER TO CORRECT TRACER FOR WEAR OF DIAMOND





Rectifier, $650.00

- Combines checking and trueing of tracer and diamond relationship.
- Tracer rectified by half-rotating motion of diamond head. Tracer ground against small grinding wheel directly below.
- Checking done with similar motion on side of indicated square preset to split .0005".
- Master square and holder for checkers included.
- One rectifier used for several dressers.

Dressing unit, $230.00

- Combines platen and diamond head. 3 diamonds and 3 tracers. Diamonds not included.
- Form dresses **hard** as well as soft wheels without removing work from grinder.
- Smallest inside radii and fillets limited only by point of diamond.
- Prices subject to change.

No form too large or too small—fits any grinder.

FORM-ALL MANUFACTURING CO.

Providing: "The Engineering Service for ALL Form Grinding"

364 Glenwood Avenue **East Orange 3, New Jersey**

Use postpaid card. Circle No. 245

Opto-Mike instrument based on two-point measuring principle.

Optical Instrument Measures Internal Diameters

A new internal measuring instrument featuring an optical vernier has been introduced by the American Gauge Corporation of Verona, New Jersey. Called the Opto-Mike, the instrument permits quick, easy bore measurements while eliminating the need for critical alignment or special operator skill or "feel".

A measurement with the Opto-Mike is accomplished with these simple steps:

(1) Instrument is inserted at an angle into the bore—(measuring anvil retracted);

(2) Measuring anvil is released and Opto-Mike is swept once a few degrees;

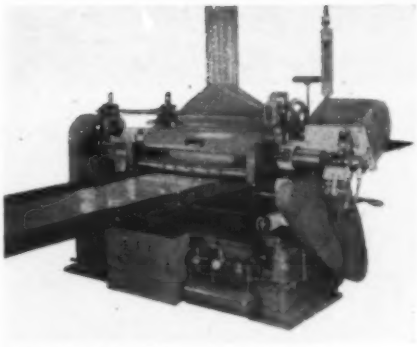
(3) Opto-Mike is carefully withdrawn and the true measurement is read on the 23-power optical vernier.

Opto-Mike finds special value for determining out of round condition. Based on the two-point measuring principle, the Opto-Mike can make two readings at right angles to one another, thus providing a precise measurement of out of round.

The Opto-Mike is available in matched sets for internal measurements from .800" to 6.000".

American Gauge Corp., 575 Bloomfield Ave., Verona, New Jersey. •

Use postpaid card. Circle No. 105



Clair Model 209 surface finisher.

Surface Finisher for Sheet or Coil Stock

Surface finishing machine for either sheet or coil stock has been developed by Clair Manufacturing Company, Inc. The new model 209 incorporates a flexible integral pinch-roll feed capable of handling material up to 2" thick at a variable rate of feed from 16 to 66 feet per minute. Emphasis was placed upon printed circuitry applications and the mechanical delusterization of unsupported transparent plastic film—in addition to the conventional surface finishing operations common to plastics, metals, etc., from "roughing" through quality bright or satin finishes.

Basic design devotes special attention to safety. Low voltage automatic control circuits include eight features designed to function as positive safety guards against physical hazards, entry of foreign material, jammed work or the like—supplemented by three independent manual means of de-energizing the safety circuits to stop the machine. The pendant type master control station is hung from a boom that may be swung to any position convenient to the operator.

Spindle floats against compressed air and is adjustable for any predetermined uniform contact pressure. Two-minute change of spindle or back-up roll, with position of synchronized back-up roll adjustable in two directions are possible.

The basic machine is available with 26 optional features or modifications, such as: spindle side oscillation mechanism adjustable 25 to 300 cycles per minute; a wide choice of horsepower and spindle speeds, different types of back-up rolls, synchronized power take-offs to drive conveyors, removable auxiliary discharge pinch-roll assembly, automatic liquid compound applicator, etc.

Where multiple or progressive finishing operations are necessary, supplementary stations, integrally controlled by master control and incorporating identical interchangeable components, are available for installation.

Clair Mfg. Co., Inc., Olean, N.Y. •

Use postpaid card. Circle No. 106

clear the air for production

Dust produced by grinding, chipping and similar operations is removed as created by down draft dust control systems, pioneered by Kirk & Blum.

Whatever your problem in industrial dust control, call on Kirk & Blum, an organization of engineers and mechanics with 50 years' experience in this specialized field.

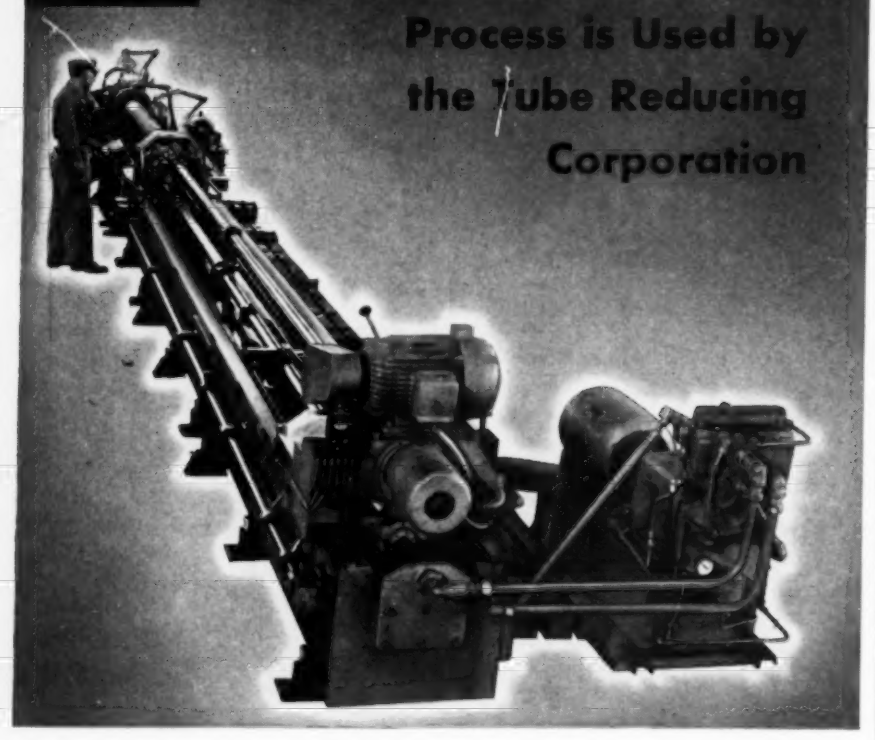
Write for complete information.
The Kirk & Blum Manufacturing Co.,
3124 Forrer Street, Cincinnati 9, Ohio

KIRK & BLUM

DOWN DRAFT DUST CONTROL

Use postpaid card. Circle No. 246

Why MICROHONING Process is Used by the Tube Reducing Corporation



The carbon steel, stainless steel, alloy steel and non-ferrous tubes manufactured by the Tube Reducing Corporation are used on applications that require high strength, uniform wall thickness and surfaces free of pits, scratches or other imperfections.

In processing its tubes, Tube Reducing uses Microhoning, either to prepare the tubing for its exclusive "Rockrite" process, or to generate functional characteristics in finished tubing.

As a preparatory operation—which produces a round, straight bore and a clean-cut, cross-hatch surface pattern—Microhoning helps to improve the results of "Rockriting." The Microhoned surface slides easily over the "rocking" mandrel and compresses to a smooth, flaw-free surface that passes the most rigid inspection and tests.

Other "Rockrite" tubes, used in such applications as hydraulic cylinders, are Microhoned after "rocking" to generate final bore size and geometric accuracy.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision"... available at your request.

☐ Please send me "Progress in Precision" in time for showing on _____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME _____

TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

Use postpaid card. Circle No. 247

NEW EQUIPMENT *continued*

Lap-King bench lapping machine.

Low-Cost Lapping Machine

The Lap-King is a 15" x 14½", bench-type portable lapping machine. Fully equipped with three lapping plates, lapping compound and lubricant, it is priced under $800. Due to the simplicity of procedure, any mechanic or machinist can operate the Lap-King efficiently. Quality control is said to be easily maintained because the Lap-King is designed to relap its own plates, one against the other, after a normal job run. This assures consistent optically-flat lapping plates for automatic accuracy of lapped work. An hour meter records the exact amount of lapping time on each plate. An automatic timer, operating in a one hour cycle, allows job time control.

The Lap-King is powered by ¼ HP motor operating on 110 volt, ac/dc power. It weighs only 165 lbs., making it easily portable from site to site.

Byron Jackson Pumps, Inc., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif. •

Use postpaid card. Circle No. 107

Air Line Filter

Emco Pneumatic Corporation announces a new fully automatic ½" Air Filter.

The Emco "Jet" eliminates moisture, sludge and other foreign substances heavier than air from entering air operated devices, thus preventing deterioration of vital parts.

The Emco L-200A-½" operates on a maximum of 90 CFM. Maximum working pressure is 300 lb. Internal parts have been treated to pass a 100 hour salt spray test. The new unit has been designed to filter air for pneumatic equipment operating on intermittent air flow.

Emco Pneumatic Corp., 1317 Locust St., Des Moines, Iowa. •

Use postpaid card. Circle No. 108

High-Speed Parts Feeders

High-speed method for automatic elevating, orienting, and feeding of parts to automated production lines has been developed by the Gear-O-Mation Division, Michigan Tool Company. The method uses a combination feeding unit that will handle parts that roll or slide, such as gears, cylinders and spiders, etc. Although the equipment is custom-tailored to a specific job, it is assembled from standard components. Feeders are adaptable to any part feeding job, especially for feeding parts to individual machines.

In operation, parts are conveyor fed or truck dumped into the hopper section of the unit. From there, they are scooped onto slanted shelves for elevating and feeding to a distribution system. When elevated, properly positioned parts roll through—improperly positioned parts are chuted again to the hopper as they fall free on the back side. Before passing into the main distribution system, parts from the elevator are again checked as to orientation by being passed over a narrowed track. If not "in-line" they drop off and are returned to the hopper.

The labor-saving unit is ruggedly built for minimum maintenance. The ½-hp motor and variable speed transmission is enclosed. Elevator height, capacity and feeding take-off rate are completely variable to suit the application.

For all models, service has been facilitated by JIC circuits and minimum lubrication requirements.

Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich. •

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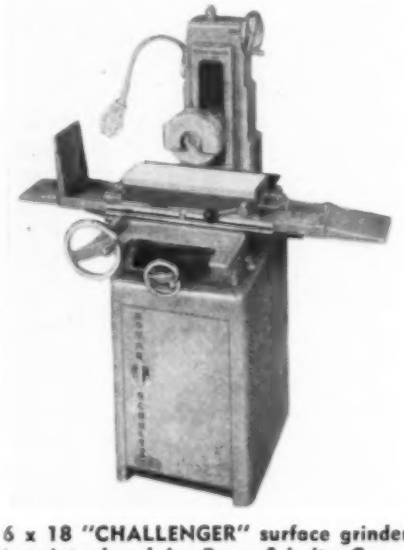
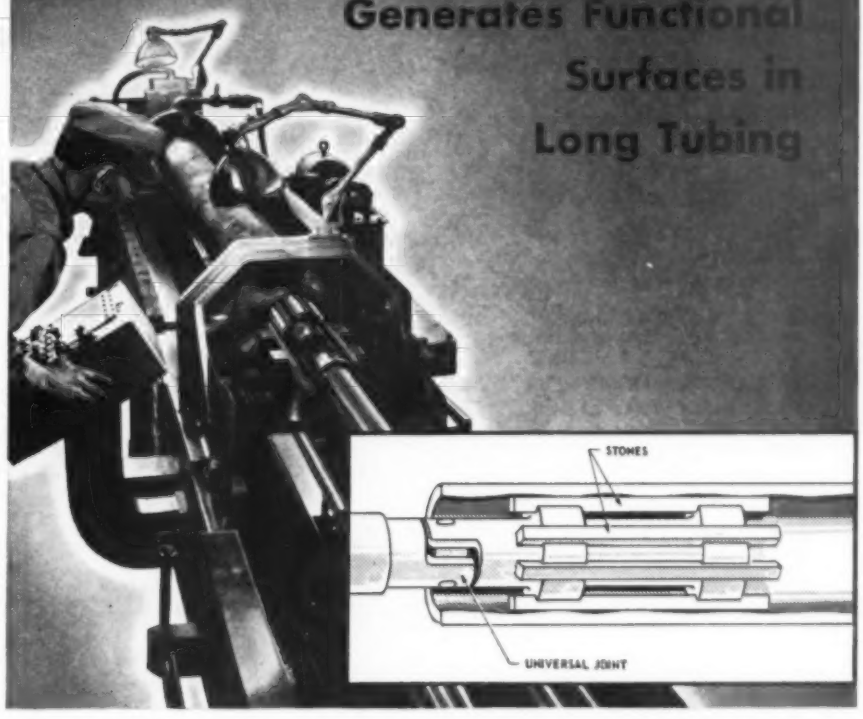


6 x 18 "CHALLENGER" surface grinder just introduced by Boyar-Schultz Corp., carries a price tag of $1395. Guaranteed accuracy is .0002-in. for flatness and parallelism. Boyar-Schultz Corp., 2000 S. 25th Ave., Broadview, Ill.

Use postpaid card. Circle No. 110

How MICROHONING Generates Functional Surfaces in Long Tubing



Microhoning is used by the Tube Reducing Corporation in processing many types of tubing that range up to 18 feet long and 9½ inches in diameter. The tubes are Microhoned on a horizontal Hydrohoner equipped with a hydraulic clamping fixture that is easily adjusted to handle tubes of various sizes.

Microhoning tools have long abrasive sticks which cannot follow irregularities in the bore. The abrasive action removes high spots while generating required surface characteristics and accurate geometry. A universal joint, connecting the tool body to the drive shaft, eliminates any tendency of abrasive action to change the bore location.

Typical processing of "Rockrite" tubes: To remove scale and deep scratches . . . hot rolled, pierced billets are first bored. Then, the bores are Microhoned—stock removal rate is .015 inch from a 4½-inch diameter x 128-inch length in less than 30 minutes. The Microhoning operation generates accurate, round, straight surfaces with the required finishes of 20 to 30 microinches r. m. s.

Send coupon for complete information.

Learn how Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

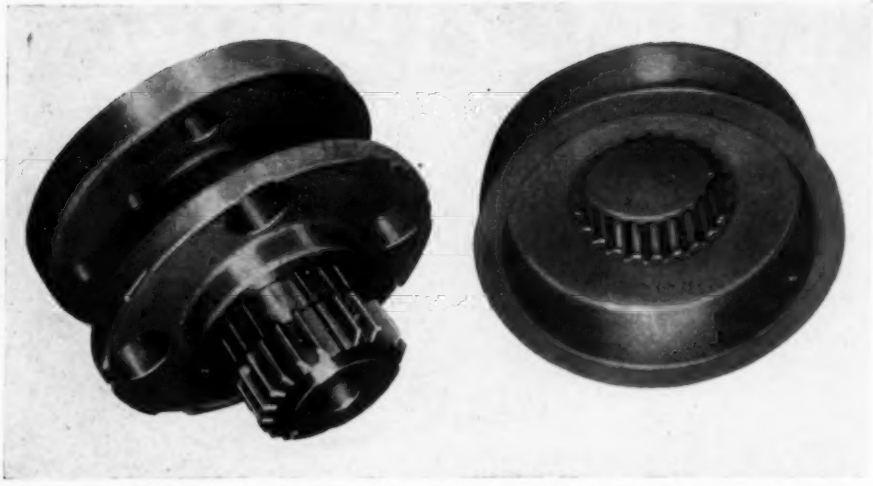
COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

Use postpaid card. Circle No. 248



TORK-LOK ARBOR with interchangeable collet for splined parts is a recent development of this widely accepted tool. Application is for grinding O.D. and flange face true to the pitch diameter of a coupling housing. Collet locates on the pitch diameter of the spline, assuring concentricity of .0005 T.I.R. in machining this part. N. A. Woodworth Co., 1300 East Nine Mile Rd., Detroit 20, Mich.

Use postpaid card. Circle No. 111

YOU GET *SPEED*

PLUS ACCURACY

WITH MOORE JIG GRINDERS

HOLES from 1/64" to 8" Relocated and Ground within .0001" in One-Third Previous Time

Before hardening, this two-station die block was Moore-Jig-Bored to eliminate the need for excessive grinding. After hardening and surface grinding, all holes were Moore-Jig-Ground to exact size and location. Blank hole and center piercing hole were ground with ½° included taper. Little clearance could be allowed between punch and die. Jig grinding time: *only 2¼ hours.*

CONTOURS, Too, Accurately Jig Ground and Checked in One Setting

This flanged punch, impractical to grind by any other method, was a natural for the No. 2 Moore Jig Grinder. All radii—male and female—were ground accurately to location and size. The piece, having been set up on a rotary table, was aligned to permit grinding of the angular surfaces. And the entire contour was inspected by the "indicator measuring" method while the punch was still on the machine.

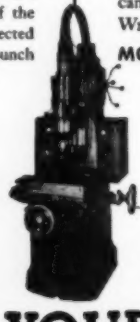
The word "versatile" must have been coined for the No. 2 Moore Jig Grinder. Not only does this machine relocate and grind straight and tapered holes with ease, but it contour grinds, chop grinds and slot grinds just as skillfully.

The Moore Jig Grinder, together with its toolroom teammate, the Moore Jig Borer, enables tool and die sections to be produced concurrently, puts diemaking on an interchangeable-parts-and-assembly basis. And it's also a time-saver on production jobs.

Employing the accurate lead screw measuring principle and a convenient system of coordinate hole location, the fast and sure Moore Jig Grinder eliminates hours of checking on bench and surface plate.

Why not find out how this remarkable machine can save *you* sizeable chunks of time and money. Write today for our detailed bulletin.

MOORE SPECIAL TOOL COMPANY, INC.
725 Union Ave., Bridgeport 7, Conn.



NO. 2 MOORE JIG GRINDER
Range 10" x 16" x 16" height. Grinding speeds from 12,000 to 60,000 rpm. Infinite feeds up and down; spindle-housing heat control. Features slot grinding attachment.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS
• PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

Use postpaid card. Circle No. 249

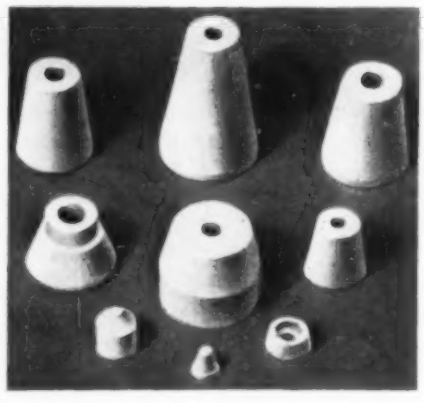
Burnishing Compound for Barrel Finishing

Oakite FM-103, the latest addition to the company's family of barrel finishing materials, has recently been introduced by Oakite Products, Inc.

Designed for use with all types of barrel finishing media or with self-tumbling work, Oakite FM-103 is said to produce a smoother, brighter finish, to prevent tarnishing during burnishing, to rinse freely, and to be economical in use. It works well on aluminum, copper, brass, nickel-silver, gold, and mild and hardened steel. With a pH of 8.5 to 8.6, the new compound contains no ingredients which would encourage the growth of bacteria or cause dermatitis. Solution concentrations of 1 to 2 ounces per gallon of water are said to develop good luster on metal surfaces.

Oakite Products, Inc., 157 Rector St., New York 6, N.Y.

Use postpaid card. Circle No. 112



Ceramic Shapes for Rotary Deburring

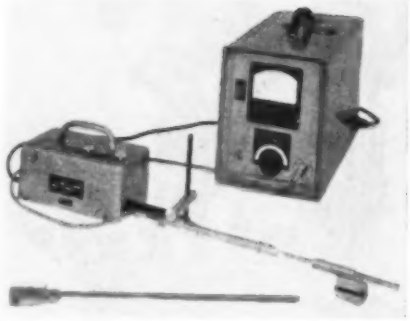
A new and efficient deburring agent for machined or stamped metal parts and sheet metals such as aluminum has been introduced in AlSiMag 491 ceramic shapes. Faster, cleaner operation is claimed when AlSiMag is used since the ceramic does not load up with metal and high speeds produce no adverse effects. Longer tool life is claimed in relation to previously used deburring tools.

Ability to produce a keen edge on precision tools—even carbides—has been demonstrated by these ceramics. Parts are custom made in desired shapes for deburring or sharpening. Diameters ranging from ½" to 3" are practical for production.

AlSiMag 491 is a fine textured, vitreous ceramic of the Alumina type. It is extremely hard (measuring more than 9 on Mohs' scale) and its strength and durability are particularly suited for these applications.

American Lava Corp., Chattanooga 5, Tenn.

Use postpaid card. Circle No. 113



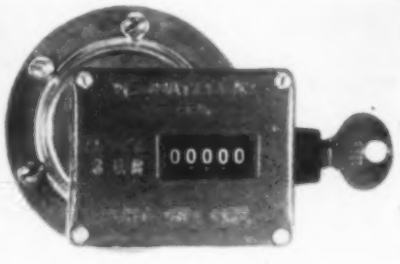
Profilometer LC Tracer measures roughness in ¼" ID.

Measures Roughness in Quarter-Inch Bores

Micrometrical Mfg. Co. announces a new addition to the Profilometer line of surface roughness measuring instruments. It's the Profilometer Type LC Tracer, designed for surface roughness measurements in ¼" dia. holes to a depth of 6". This standard length tracer is also available in longer or shorter lengths depending upon the requirements of industry. Details are given in bulletin LT 131.

Micrometrical Mfg. Co., 345 South Main St., Ann Arbor, Mich. •

Use postpaid card. Circle No. 114



Pneumatic or hydraulic pressure triggers this cycle counter.

Cycle Counter for Automatic Machines

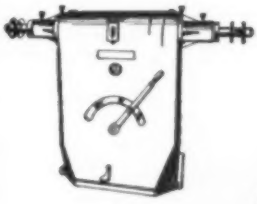
A new line of automatic counting devices for any operation controlled by pneumatic or hydraulic action has been announced by Pneumaticount, Portland, Oregon. Counters screw into the line controlling any air or hydraulic cylinder and can be completely installed in only five minutes. There is no linkage to assemble or get out of adjustment, no solenoid; and no possibility of half or miscounts. The unit can be easily attached to automatic machines. Models are available for from 10 to 500 pounds and up to 300 counts per minute. All models are available with five or six digits and knob or tamper proof key reset. Electric activators for predetermined counters also available in the Pneumatic line.

Pneumaticount, 3400 N.E. 54th Ave., Portland, Oregon. •

Use postpaid card. Circle No. 115

GRINDERS . . .
BUFFERS

BUFFERS—
Direct, Belt, gear, vari-speed



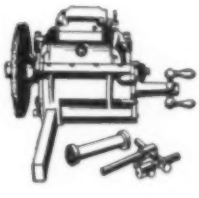
These superb electrical grinders and buffers . . . 1/3 to 40 hp . . . set the pace for highest quality and efficiency . . . and for amazing savings in cost and maintenance. Preferred by industry everywhere!

ATTRACTIVELY PRICED

United States Electrical Tools

Over 60 years of Service to Industry

GRINDERS—
Lathe, tool post, angle plate, vertical spindle



GRINDERS . . .

Direct, gear, belt drive, swing frame, vari-speed single or dual motor, portable, bench, angle plate, die, wet, disc and snagging grinders; combination grinder and buffer.

BUFFERS

Direct, belt, gear, vari-speed buffers.

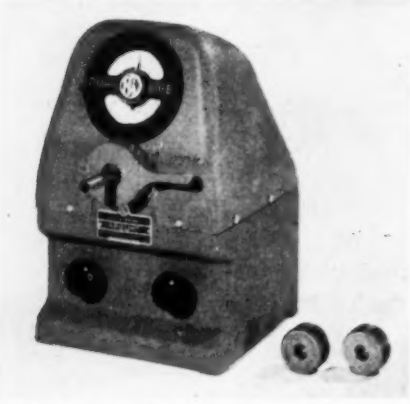
United States Electrical Tools are electrically and mechanically correct.

ALL ROTATING PARTS AND SPINDLES ARE PRECISION-BALANCED DYNAMICALLY BY LATEST ELECTRONIC EQUIPMENT

WRITE FOR CATALOGS

The United States Electrical Tool Co.
3640 LLEWELLYN ST., CINCINNATI 23, OHIO

Use postpaid card. Circle No. 250



NEW CONTRIBUTION to control of high-precision production is the Dual-Aire Air-O-Limit Comparator, one of the six new products which will be unveiled by Pratt & Whitney Co. Inc. at the annual exposition of the American Society for Quality Control May 22-24 in Detroit. Comparator, designed for use at the machine on close tolerance grinding or lapping operations and close tolerance segregating, provides two separate magnifications simultaneously without switch-over. Thus operator can use the low magnification scale during preliminary stages, reading deviation from final size to .0001" increments. As finished size is approached, operator can observe high magnification scale and read part size directly to within a few millionths.

Use postpaid card. Circle No. 116

A BETTER BACK-UP WHEEL

R57

FOR YOUR ABRASIVE BELTS

45° scoop tooth used for aggressive stock removal

AVAILABLE NOW IN POPULAR 14" DIAMETER SIZES AT BIG SAVINGS

You can get the new R-57 RUBBER CONTACT WHEELS at lower prices in 14" DIAMETER sizes **due to newly developed production techniques. These new wheels have all the well-known features of the R50 and R-54 models.—LONGER BELT LIFE . . . OIL RESISTANT RUBBER . . . WET OR DRY OPERATION . . . HEAT DISSIPATION . . . MAXIMUM SAFETY . . . other features. And what's more these wheels have a 30% trade-in value.

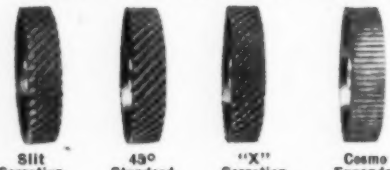
**The new R57 and the R50 and R54 contact wheels are available in many popular sizes . . . ½" to 22" DIAMETERS in WIDTHS from 1" to 6". Other wheels made to your specifications in all widths and diameters.

14"

TYPE	WIDTH OF FACE 1"	2"	3"	4"
PLAIN	32.00	34.00	36.00	38.00
SERRATED	37.00	39.00	42.00	44.00

AVAILABLE IN PLAIN OR SERRATED FACE IN ALL DUROMETERS

A WHEEL FOR EVERY OPERATION



Slit Serration	45° Standard	"X" Serration	Cosmo Expander
Aggressive Contact Work	Stock Removal	Moderate Contour Work	Backstand Idler Not Needed

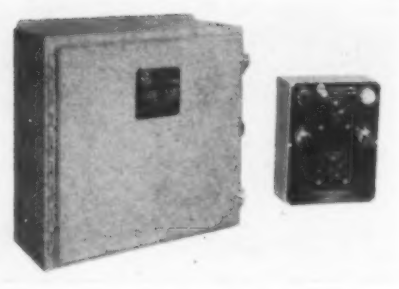
DElta 6-8900

CHICAGO RUBBER COMPANY, INC.

451 MARKET STREET • WAUKEGAN, ILLINOIS

Specializing in Contact Wheels and Industrial and Printers Rolls

Use postpaid card. Circle No. 251



Sundstrand magnetic chuck control for demagnetizing parts.

Magnetic Chuck Control

New Power-Grip control units for low-voltage (24-volt d-c) Sundstrand Magnetic Chucks are announced by Sundstrand Magnetic-Pneumatic Products Division of Sundstrand Machine Tool Co. Three basic types of control units are available for use with chucks rated up to 4000 watts. Demagnetizing cycle for all control units—large or small—requires a maximum of seven seconds.

The Power-Grip control units, consisting of a dust-tight control cabinet and remote control station, have been designed to machine tool standards, and operate from a 110-volt a-c pilot circuit.

Type "A" units, smallest in the line, are rated up to 125 watts with Types "B" and "C" units being available in a total of 15 ratings, ranging to 4000 watts. Basically, all models operate on the same principle using a heavy-duty power transformer and a selenium rectifier in a single-phase bridge circuit to furnish d-c power to the magnetic chuck.

When work is to be released, magnetism in the workpiece is overcome by automatically switching the d-c supply to the magnetic chuck through a series of forward and reverse pulses. A multi-lobed cam, driven by a subfractional horsepower motor, actuates a limit switch to energize and de-energize a reversing contactor in the d-c supply line between the rectifier and the chuck. These pulses become progressively shorter during the seven-second demagnetizing cycle.

The type "A" unit remote-control station has a three-position switch—hold, release, and off—and two indicator lights, one to indicate the a-c supply is "on" and the other to indicate d-c is being supplied to the chuck. The pilot light indicating that d-c is being supplied to the chuck flashes "on" and "off" during the seven-second demagnetizing cycle. Type "B" and type "C" units use pushbuttons for hold

and release, and, in addition, have a four-position tap switch to control degree of holding power.

Type "C" units have still another feature that provides extra demagnetizing power when needed. External forces, such as heat and vibration from the action of a cutting tool, often extend the magnetic lines of force deeper into the workpiece than is normal from the magnetic field created by the chuck. Under these conditions, demagnetizing at normal power would not overcome this extended magnetic penetration. A second tap switch on the control unit has four positions with No. 1 providing demagnetization at normal field strength and the other steps through No. 4 providing progressively higher field strengths. Demagnetizing time remains at seven seconds, regardless of the setting of either tap switch.

Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill. •

Use postpaid card. Circle No. 117

Vapor System Increases Tool Life

New cooling and lubricating system for high speed cutting tools has been announced by the Precise Products Corp.

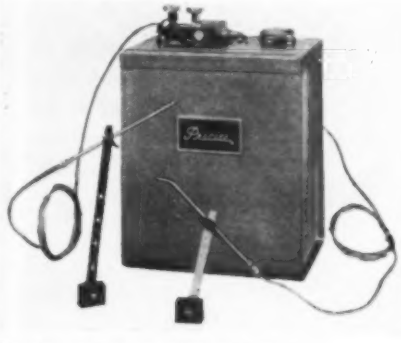
The unit creates a blast of vapor at the point where the cutting is done. Two separate lines are employed, a coolant line and an air line. At the point of work these two lines form a micro diffused liquid vapor. The liquid vapor formed is many degrees cooler than ambient temperatures, permitting more effective cooling and lubrication of cutting tool and work.

The Precise Vapor Lub system is ideal for use with high speed spindles, using grinding wheels or carbide cutters, but is also very effective on conventional milling machines, drill presses or tapping operations.

Equipped with a two gallon tank, adequate for several days of operation, and two complete cooling circuits each having an adjustable air liquid valve. Mounting of the unit is fast and simple through fully adjustable magnetic holders.

Precise Products Corp., Racine, Wis. •

Use postpaid card. Circle No. 118



Precise vapor cooling system.

DI-MET

Carbide Microinch Finisher

The answer to low cost finishing of carbide and ceramic cutting tools!

Produces ½ to 6 microinch finishes in 2 minutes or less!

Here's what micro finishing of cutting tools can do for you!

1. Increases tool life from 200 to 700%
2. Raises cutting speed (sfm) 50 to 100%
3. Increases feed and depth of cut 50 to 100%
4. Decreases surface roughness of parts 100 to 500%

The DI-MET Carbide Microinch Finisher employs two Meehanite cast iron laps. Impregnated with DI-MET Diamond Compound, these laps can be used in sequence for fast rough lapping and finish lapping, or when both are impregnated with same grade of diamond compound, can be used simultaneously for finishing with double the output.

DI-MET DIAMOND COMPOUND

A *better* lapping and finishing compound that won't throw off under centrifugal force, that polishes faster and easier, and that produces uniform finishes free from scratches. Water soluble for ease of cleaning and changing grades. A demonstration will prove its extraordinary value!

ANOTHER PRODUCT OF FELKER RESEARCH

di-met CORPORATION

DI-MET CORPORATION
TORRANCE, CALIFORNIA

Ask for free folders on the DI-MET CARBIDE MICROINCH FINISHER AND DI-MET DIAMOND COMPOUND!

Use postpaid card. Circle No. 252

Vibration Monitoring Protects Machines

A new non-electronic vibration monitor system that is sensitive to increases in vibration yet ignores both starting vibration and transient shocks normal to operation, has been developed by the Fielden Instrument Division of Robertshaw-Fulton Controls Co.

System combines the Model 65 malfunction detector, for mounting on the protected equipment, and the new model 651 A.C. control unit which is wired to the detector through three-quarter inch conduit.

Applications include the protection of pumps, motors, blowers, compressors, centrifuges, engines, turbines and other costly equipment. The model 651 control unit is available for operation with 115, 230 or 460 V.A.C. control circuits. Models are also available for use in D. C. circuits.

Fielden Instrument Div., Robertshaw-Fulton Controls Co., 2920 North Fourth St., Philadelphia 33, Penn. •

Use postpaid card. Circle No. 119

Cabinet-Base Dust Collector

To blend with the good housekeeping standards in new and existing plants the trend is for each grinder installation to have a self-contained dust collecting system.

Self-contained dust collector.

The Standard Electrical Tool Co., 2488-96 River Rd., Cincinnati 4, Ohio now have a complete line of their "Grind-Air-rester." The new 7", 8" and 10" sizes as illustrated with the previous 12" and 14" Grind-Air-rester complete the line.

The sturdy cabinet-base contains the dust collecting system assembled complete with the heavy duty grinder. Floor space compares with the conventional grinder. The cost or effort of installing this combination unit is no greater than the grinder only.

The unit as illustrated arrests the grinding grit and dust at its source, thus protecting workers' health and minimizing the exposure of the adjacent machinery to this harmful grit and dust. •

Use postpaid card. Circle No. 120

Diamond Wheel Dressing

Cratex Manufacturing Company announces a new method for dressing and cleaning metal bonded diamond wheels. It has been found that Cratex (rubberized abrasive) Blocks do a fast and effective job of removing smear metal and clogging from diamond wheels.

Because of its cushioned action, the Cratex Block "flows" around the diamond particles, and cleans away smear metal with minimum danger of knocking diamond particles loose. With this new method the diamond wheel is quickly and easily restored to its maximum cutting action and the life of the diamond wheel is greatly increased.

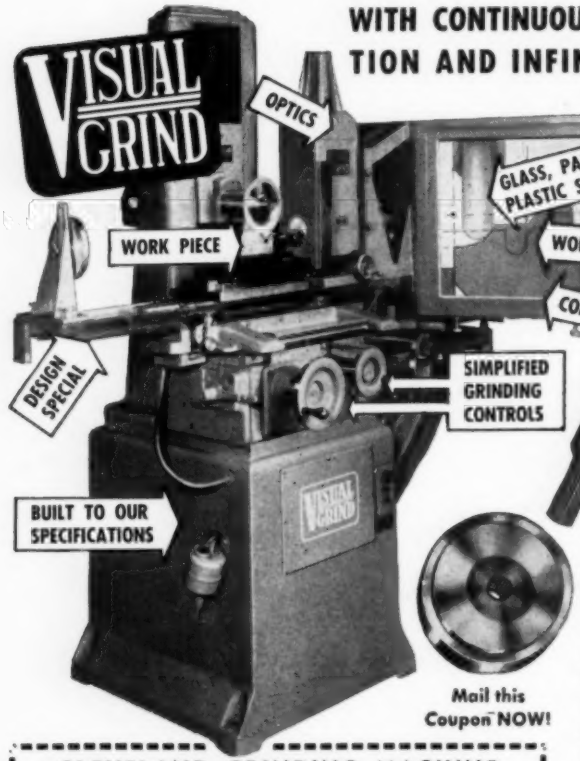
Cratex Mfg. Co., 81 Natoma St., San Francisco 5, Calif. •

Use postpaid card. Circle No. 121

TOP FIRMS SHOW

PROVED SAVINGS UP TO 75%

IN SET-UP AND GRINDING TIME WITH CONTINUOUS WORK INSPECTION AND INFINITE PRECISION



SIMPLIFIED OPERATION

When working with TUNGSTEN CARBIDE, STAINLESS STEEL, STELLITE or TOOL STEELS, VISUAL GRIND permits a semi-skilled operator to grind precision pieces without continued checking with the comparator. Automatic inspection is accomplished with the built in optical comparator.

Visit our plant . . . let us show you how VISUAL GRIND will speed production — cut costs.

Mail this Coupon NOW!

CLEVELAND GRINDING MACHINE
1660 Eddy Road Cleveland 12, Ohio

Gentlemen:

☐ Please have your representative call at our plant. The most convenient time would be (week) _____

☐ Phone for appointment

☐ Please send us complete information on the new VISUAL GRIND.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

Use postpaid card. Circle No. 253

Blohm Simplex 12x20 surface grinder.

Imported Surface Grinder

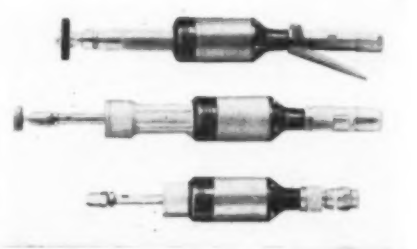
Blohm "Simplex" Surface Grinder features simplified controls and a built-in exhaust and wet grinding system. Square design base provides the utmost in structural rigidity. The already proven 5½ horse-power Blohm motorized spindle is used. Standard grinding wheels may be used.

The table rides on specially designed ball bearing slide units, which in turn ride in hardened, ground and lapped special alloy steel inserted ways. Hydraulic longitudinal table actuation, variable from 0-85 inches per minute; and electrically actuated cross travel variable from .004" to 2½" per table reciprocation, is provided.

Machine has a grinding capacity of 12-in. wide by 20-in. long and permits a maximum of 14¾" from the centerline of the spindle to the table top. Complete line of accessories are available.

This machine is imported, distributed and serviced nationally by the Maserati Corp. of America, 662 Main St., Westbury, L.I., N.Y. •

Use postpaid card. Circle No. 122



Rotor Tool Company announces the addition of a new line of small wheel air grinders known as the M1170 series. They are, top to bottom: (a) M1172—Small End Type Small Wheel Grinder, (b) M1171—Long Type Small Wheel Grinder, (c) M1170 — Short Type Small Wheel Grinder. Principal features: 50% more power, balanced centrifugal governor on all speeds for maximum power and peak performance, simplified construction for easier maintenance, quiet operation without restricting power. There are 45 basic models and 20 different arbors and collets to choose from. The Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 32, O.

Use postpaid card. Circle No. 123

Electronic Controller Protects Electric Motors

Positive protection against the overloading of electric motors is provided by the automatic Meco-Tronic Controller, offered by The Manufacturers Equipment Co., Dayton 4, Ohio.

This compact electronic device can be used with any electrically driven equipment, such as mixers, agitators, conveyors, elevators, machine tools and pumps. According to the manufacturer, it responds immediately to any increase in drive-motor current, thus providing a safeguard for equipment and personnel. Its use prevents costly shutdowns for motor repair or replacement caused by an overload or jam of the equipment. As soon as the overload is removed, it automatically allows the mechanism to operate.

The Meco-Tronic Controller can be used with any size motor. One unit can be used to protect several motors. In many cases, the use of this device releases attendants for other duties.

Manufacturers Equipment Co., 218 Madeira Ave., Dayton 4, Ohio. •

Use postpaid card. Circle No. 124

HAMMOND MODEL VRRO
Two-Spindle Variable Speed Lathe

STEP UP PRODUCTION—REDUCE FINISHING COSTS with Hammond DOUBLE SPINDLE LATHES

- No "down time" for one operator when the other changes wheel — each operator has his own motor, control and variable speed drive.
- Convenient Variable Speed dial is within arm's reach of the operator — no "climbing" around in back to change speeds.
- Wheel economy and better finish. As wheel wears each operator can increase speed — to maintain constant peripheral speed for uniform and better finish, maximum production and wheel life.
- Available in 3 sizes — two 5 HP, two 7½ HP or two 10 HP.

ALSO AVAILABLE IN WIDE SWING MODEL VRROW

Wide swing construction, with extended bearing housings and spindles, provides additional working space for large, bulky pieces.

Cost reduction is the need of the day — Write for catalog.

Hammond OF KALAMAZOO "Good Machinery Since '82"

Hammond Machinery Builders

1651 DOUGLAS AVE. — KALAMAZOO, MICHIGAN

Use postpaid card. Circle No. 254

GO AND NO-GO SNAP GAGE is quickly made up for long runs with Shop-Bloks and Micro-Step holders. Direct use of Shop Blocks with grade A accuracy eliminates principal causes of costly errors in production gaging. The same components may be used over and over again, thereby making this a very economical as well as exceptionally accurate gage. The DoAll Co., Des Plaines, Ill.

Use postpaid card. Circle No. 125

STONE CUT-OFF MACHINES do a better job

FASTER, CLEANER and at LOWER COST!

Stone

12″ or 14″ (Swivel Head) CUT-OFF MACHINE

CAPACITY: Ferrous, 1½″ Solids, 2½″ Standard Pipe and 2½″ Structurals. Non-Ferrous, 2½″ Solids, 3″ Tubing and Extrusions.

MODEL M-35A is equipped with a quickly adjustable positive-locking swivel head for cutting up to 45° in either direction, providing superior operation at a lower original cost than any other comparable machine. Positive geared-in-head drive delivers all of its power to cutting wheel. The machine is designed and built to give you long, trouble-free service under the most rugged conditions. Adaptable for wet cutting.

MODEL M-35B (12″ or 14″ Cut-Off Machine) has same capacity as Model M-35A. Straight edges adjustable for 90° or 45° cutting. Adaptable for wet cutting.

MODEL M-35 (12″ Cut-Off Machine) for 90° cutting has same capacity as Model M-35A.

Power stroke of cutting head and other optional equipment available for all of above. All three machines cut at a rate of less than 4 seconds per square inch, leaving a mill-like finish.

For specifications, optional equipment and costs, write to:

STONE MACHINERY CO., INC., 121 Fayette St. Manlius, N.Y.

STONE MACHINES ARE REPRESENTED IN EVERY MAJOR INDUSTRY THROUGHOUT THE WORLD

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Dust Collector

A new dust collector known as the Number 20C30 has been announced by the Aget Manufacturing Co. It is an air recirculating type that requires no outside exhaust outlet, and has an air capacity of 2,405 C.F.M. and a dust storage capacity of 6 cubic feet.

Dust particles are separated from the air within the unit by a cyclone separator, and the dust is precipitated into a bin located in the base. Air is exhausted into a 3′ x 7½′ bag, which filters out the finest dust particles and releases the dust free air into the work area. The bag is cleaned by shaking.

The 20C30 is designed specifically for use in pattern shops, model shops, and smaller woodworking industries. It can also be used efficiently in buffing and grinding operations, and has many applications in the chemical industry.

Aget Mfg. Co., Adrian, Mich. •

Use postpaid card. Circle No. 126

Multi-Barrel Finisher

Designed as a heavy-duty unit suitable for many tumbling, burnishing and deburring operations, Model V-16 multi-barrel finishing unit features a variable-speed direct gear drive. This eliminates need for chains and sprockets and permits simple speed adjustments from 8 to 25 rpm. With built-in magnetic brake and perforated metal safety guard in front of barrels, fast production finishing can be performed with full control and safety.

Added features include large 16 cu. ft. capacity, choice of one to four compartment barrels, no-seam vinyl barrel linings, 3 h.p. motor, forward and reverse jogging switches and all-welded ¼″ steel plate construction. Typical uses are finishing of flat washers, screw machine parts, die castings, jet blades, threaded bolts and similar parts. Model V-16 has 30″ clearance under barrels and measures 82″ long by 42″ wide and 64″ high.

Rampe Mfg. Co., 14915 Woodworth Ave., Cleveland 10, Ohio. •

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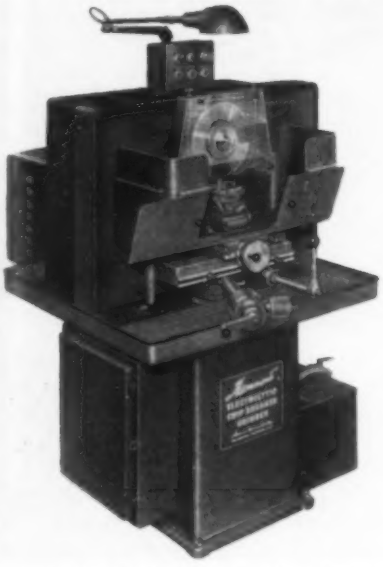
Rampe V-16 accommodates 1 to 4 compartment barrels.

Chip Breaker Grinder Includes Electrolytic Hook-Up



Hammond electrolytic chip breaker grinder.

Hammond of Kalamazoo recently announced a new Electrolytic Chip Breaker Grinder for 6" and 10" diameter wheels. This grinder provides smooth, fast, single-pass, full-depth grinding. The spindle is extra heavy and dynamically balanced, with precision fitting and furnished with large and preloaded duplex ball bearings. A tapered spindle nose assures true wheel mounting.

The table reciprocates on hardened and ground ball bearing ways and the "Any-Angle" vise accommodates tools up to 2½" wide. Other features include a built-in mist collector which returns the captured coolant to the pump and tank unit in the base.

With electrolytic grinding, the machine is said to reduce the consumption of diamonds between 80% and 90% and provides a tremendous advance in grinding ease, speed and cost reduction.

Hammond Machinery Builders, 1651 Douglas Avenue, Kalamazoo, Mich. •

Use postpaid card. Circle No. 128

Comparator Has Go, No-Go Lights

A new "Go" and "No Go" Electric Limit Contact Gage indicating by light signals is announced by the George Scherr Company.

The signal light attachment used for this purpose reports accurately within 20 millionths of an inch over and undersize as well as correct size by flashing of green, red or yellow light. A second socket for control connection makes further automatic operation possible.

The electric comparators come in two basic types, with dial and without dial. Dial type will permit observation of the position relative to tolerance limits on the dial in addition to the action of the signal lights.

Automatic controlling devices may be attached to the second socket of the signal light box. For instance, an acoustic signal may be sounded. Or changes in dimensions beyond tolerance limits may be announced acoustically in comparators checking running work which are not observed continuously. Small parts may be segregated according to gaging results through switches controlled by the electric limit contacts, and the work guided into various sorting channels. By installing auxiliary relays in the control circuit, it is possible to use heavier devices with a larger electric load, such as one that stops a machine whenever the work is gaged off-size by the comparator. The

initial cost of a unit is as little as $235.00.

George Scherr Co., Inc., 200 Lafayette St., New York 12, New York. •

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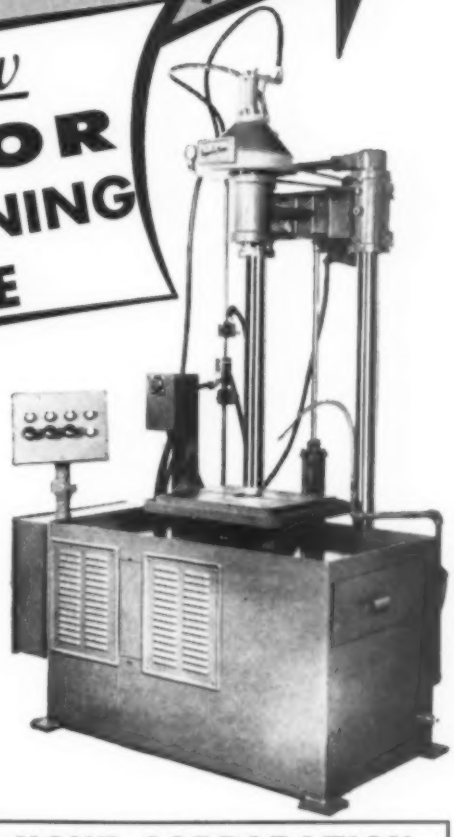
High Production Honing *with* Real Flexibility

The New SUPERIOR VERTICAL HONING MACHINE



Capacity up to 4-inch diameter and 12-inch height. Spindle speed infinitely variable 225 to 550 rpm. Jogging switches permit working in any section of the part without resetting the stroking limit switches. Honing cycle electronic timer controlled 6 to 120 seconds. Driving head hydraulically controlled for stroking and constant stone expansion pressure.
4-way adjustable ground table.
Integrally sealed driving head spindle bearings.

For complete details and prices on this and other Superior Honing machines, use coupon.

Stocked in All Principal Cities

SUPERIOR HONE CORPORATION
1637 Elreno Street • Elkhart, Indiana
Please send details and prices on Vertical Honing Machine.
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News of Industry

ASTE Metal Cutting Research Project

The American Society of Tool Engineers Research Fund recently presented a progress report on the initial stage of its metal cutting research project. Established to tackle metal cutting research in the areas most valuable to industry, for the purpose of cutting down the cost of metal cutting operations, the over-all program is expected to require a minimum of five years to complete.

Stage one consists of the compilation of a metal cutting bibliography with specially prepared abstracts of all available information from 1943 to date. This assignment was given to the John Crerar Library and its research information service in September 1955, anticipating that a two-year period would be required to complete the bibliography.

The second stage, seven months underway, is the evaluation of all metal cutting literature by the Battelle Memorial Institute—to be completed in the spring of 1958.

The third development will seek ways and means of establishing unified standards in machinability test procedures and reporting methods. •

Omer E. Robbins Adds To Plant Facilities

Omer E. Robbins Company, manufacturer of the "Magna-Sine" and other angular tool room equipment, has completed a new 10,000 square foot one-story building. The new building, located on the company's six acre tract at 24800 Plymouth Road, Detroit, adds to present manufacturing and office facilities at the same address.

Increasing volume in the Robbins line of special automatic assembly machines necessitated the additional facilities, according to Omer E. Robbins, Jr., vice president and general manager. Administration, sales, engineering and manufacture of special assembly machines will be carried out in the present building, while the new quarters will be devoted to manufacture of the Magna-Sine, other toolroom equipment and future production programs. •

Allison
Abrasive Cutting Wheels

Abrasive Cutting Know-How

Know-How is just as vital to top performance in abrasive cutting as in any other machine tool operation

FINE FINISH and NO BURNING with ABRASIVE CUTTING in YOUR TOOL ROOM

for fast, cost-saving, fine-finish cuts of such Tool Room materials as these...

- **High Speed Steel**
- **Tool Steel**
- **Heat Treated Steel**
- **Oil Hardening, Air Hardening and Shock Resistant Alloys**

Nearly everyone knows that Abrasive Cutting is the fastest, lowest-cost means of cutting the tougher, harder metals...at cutting speeds of 6 to 10 seconds per square inch of cut...in sizes ranging from the smallest stock to 12″ x 12″ solid billets and 14″ diameter tubing.

But many metal-working men are not yet aware of the fact that these same Abrasive Cutting benefits of speed and low cost are applicable to critical Tool Room Materials...that abrasive cuts of heat-sensitive metals can be made with Fine Finish and No Burning, Checks or Cracks.

It's not a trick...it's a matter of Know-How...the kind of Know-How that is available to you through your Allison Field Engineer, an experienced Abrasive Cutting Specialist.

He is likely to prescribe wet cutting for most tool room metals...dry cutting for metals adversely affected by the quenching action of coolants ...wheels with the types and sizes of abrasive grains, the particular bond and hardness that fit the jobs to be done...thin wheels (available from Allison from .006″ thickness) and special spindle speeds for fine slotting...quick, economical methods of salvaging worn tools or cutting blanks of stock for special tools needed in a hurry.

***For more complete information** write for this helpful booklet—*
ABRASIVE CUTTING BY ALLISON

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Allison Division • AMERICAN CHAIN & CABLE

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Company Briefs

The **Esbec Barrel Finishing Corp.,** Byram, Conn., has announced the appointment of the **Illinois Deburring Co.,** 3159 W. Madison, Chicago, as northern Illinois representative.

A major expansion program, including a move of facilities to a modern plant in the Southwest Industrial Park section of Cleveland, has been completed by the **Sterling Die division of Pratt & Whitney Co., Inc.,** West Hartford, Conn. To celebrate the occasion, an open house was held April 30 for its customers.

Two new sales representatives have been appointed by **Size Control Co.,** Chicago. **Production Tool and Gage Co.,** 468 Monroe Ave., Rochester, N.Y., is headed by **Homer L. Lacock. Alan Korest,** 900 Monroe Ave. N.W., Grand Rapids, Mich., will serve customers in that area.

The plant of the **Peninsular Grinding Wheel Sales Corp.,** Detroit, will be closed for a two-week vacation from July 15 through July 26.

To provide more efficient service

facilities for users of their portable electric tools, the **Black & Decker Mfg. Co.** has opened a factory service and sales branch in Washington, D.C., at 2353 Rhode Island Ave., N.E. **Wm. W. Adams,** formerly a repairman in the Baltimore branch, has been appointed service manager of the new branch, which is under the over-all supervision of **R. A. Wernsdorfer,** northeastern regional service manager.

Personnel Briefs

William LaCoste Neilson, vice president and former director of Norton Company, died March 5 in New York City. During his 50 years with Norton, Neilson either helped establish or manage nearly all of the company's plants in Australia, Canada, England, France, Germany and Italy. He had been a consultant for the U.S. Treasury Department, U.S. Department of Agriculture, and a member of the Munitions Board.

H. Pelphrey has been appointed Director of Engineering Research, Michigan Tool Company, Detroit. Pelphrey will direct much of Michigan's expanding work in the gear development field. He was formerly chief research engineer.

John Matchulat has been promoted from superintendent of the crucible and refractories division of Electro Refractories and Abrasives Corp. to plant manager in charge of production.

Dr. Paul F. Genachte, Director of the Atomic Energy Division, Chase Manhattan Bank, has been elected to the Board of Directors of Firth Sterling Inc.

Stephen Smith has been appointed Manager of the Sales Service Department by Norton Company. Formerly supervisor of the sales department, he will be responsible for quotations and special pricing, special packaging, complaint adjustments, warehouse liaison and stock control and special sales statistical studies.

Peter Iaffaldano has been appointed a field engineer assigned to Norton Company's Cleveland District office.

Three new directors have been named by Norton Behr-Manning Overseas, Inc. They are **Frank M. Ryan, Dr. Wilfred F. L. Place,** and **John R. Alli-**

Hogren Dearborn Schleicher

G & F GIVEN SAFETY AWARD—For the second consecutive year, GRINDING AND FINISHING has been awarded the National Safety Council's Public Interest Award, made annually to public information media for exceptional service to safety. On hand to receive the award from Ned H. Dearborn, Council president, were V. C. Hogren, Hitchcock Publishing Co. executive vice president; and William F. Schleicher, vice president and editorial director, Hitchcock Publishing Co.

Production Grind - Tungsten Carbide - Steel - Stainless Glass - Plastic or Carbon to .0002 or 6 to 8 Micro finish *

on the ROYAL MASTER TG-12 Centerless Grinder

Apply the versatile Royal Master TG-12 to your grinding problem.

It will finish grind from .004 to 1½ inches in diameter.

It may be used for either plunge or thrufeed grinding with conversion to either a matter of minutes.

It may be put to work **without** prior spindle warm up time with unparalleled accuracy and dependability - (Based on machines in use for 5 years.)

Low depreciation based on initial cost - Ease and speed of set up time due to accessibility of work zone - Rapid replacement of work wheel and packaged hydraulic system for automatic cycling, are other features of the TG-12. What are your requirements?

* **May we demonstrate the TG-12 for you on your parts?**

Also Grinds Wood, Non-ferrous Metals, Fibre, Hard Rubber, Cork, etc.

☐ **Please contact me regarding my "centerless grinding" requirements.**

☐ **Please forward literature describing the TG-12.**

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ROYAL MASTER INC.—200 STATE HWY. 23, RIVERDALE, N. J.

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PRECISION DIAMOND TOOLS

Industrial Diamonds
Thread Grinders
Turning Tools
Engraving Tools
Dressing Tools
Diamond Powder

Manufacturers of
DIAMOND TOOLS
and
WHEELS

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CINCINNATI, STEVE URBAN, 1717 Section Avenue
CLEVELAND, BILL WIESE, 8905 Lake Ave.
DETROIT, FLOYD BEARSS, 1433 Northwood Blvd., Royal Oak, Mich.
INDIANAPOLIS, IVAN STRANGE, 33 Tyler Ave., Greenfield, Ind.
PHILADELPHIA, H. J. MILLER, Valley Brook Rd. and Glen Mawr Dr., Ambler, Pa.
ROCHESTER, N.Y., DON GINEGAW, 10 Oak Manor Lane, Pittsford, N.Y.
SYRACUSE, N.Y., BARNES & JORDAN, INC., 409 E. Jefferson St.

Representatives in Principal Cities

CLIPPER DIAMOND TOOL CO., INC.

345-E HUDSON ST. NEW YORK 14, N.Y.

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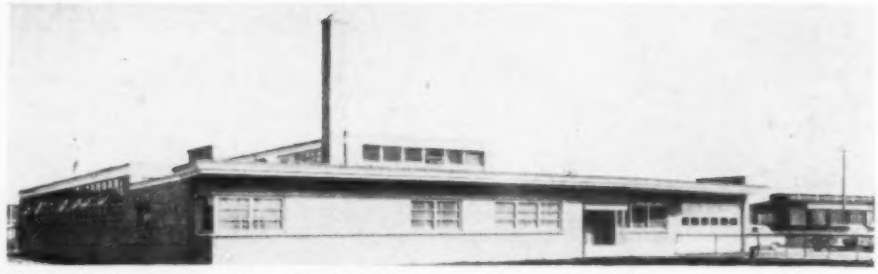


THIS NEW 16,000 SQ. FT. PLANT near Chicago's Midway airport represents Bronson & Bratton's second expansion for manufacturing cemented carbide dies in nine years of operation. The company is the largest carbide die manufacturer in the Midwest.

son. The new positions are part of a reorganization of the structure of the company made necessary by the increased activity of the firm.

Hans Wickstrom, retired sales representative for Norton Company's Grinding Machine Division, died at his Worcester, Massachusetts, home February 13 at the age of 86. Wickstrom helped build the first Norton cylindrical grinding machine in 1900.

Harold C. Miller, formerly associated with the Armour Research Foundation in Chicago, has been named chief research engineer of Super-Cut, Inc., Chicago.

Maurice J. Coughlin has been appointed director of procurement for Bell Aircraft Corporation.

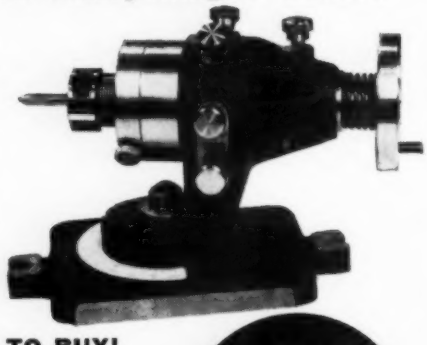
William T. Loeck has been appointed Pacific Coast Division Sales Manager of the Coated Abrasives Division, Armour and Company, Alliance, Ohio. Mr. Loeck has been associated with Armour and Company for the past 25 years.

The "R & A"
HIGH QUALITY PRECISION TAP GRINDER

Makes Grinding A Tap As Easy As Sharpening A Pencil!

Has All the Money-Saving Features of Higher Priced Machines!

Grinds and Relieves Chamfers of any Tap, Right or Left, up to ⅝".



- **NO COLLETS TO BUY!**
- **NO CAMS TO CHANGE!**
- **CAN BE USED ON ANY GRINDING MACHINE!**
- **PROVIDES UNIFORMITY FOR LONG PRODUCTION RUNS!**

LOWEST PRICE EVER! $195

Write for Bulletin Number 24

R & A MACHINE CO., Inc.
100 GROVE ST. WORCESTER 5, MASS.

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HOW TO WIN ARGUMENTS

on Surface Roughness!

FREE BULLETIN LT85 tells–

★ Why time is wasted by arguments about the roughness of parts produced.
★ How to end such arguments FOR SURE.
★ How shop men, engineers and management all gain when such arguments are settled by the Profilometer.

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MMC MICROMETRICAL MANUFACTURING COMPANY
341 S. MAIN ST. ANN ARBOR, MICHIGAN

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James Edwards, Product Development Engineer at Australian Abrasives Pty. Ltd., Auburn, N.S.W., Australia, has arrived in New York for a three month's training visit to Norton Company, Worcester, Massachusetts. Edwards will study latest developments in abrasives, grinding wheels and diamond wheels.

Frank M. Ryan, vice president of **Norton Behr-Manning Overseas Inc.,** of Worcester, Mass., arrived in Japan April 6 as a member of a U.S. Department of Commerce Foreign Trade Mission. During the six week stay in Japan, this mission discussed mutual trade problems with leading Japanese businessmen throughout that country. The six-member panel also staffed the information center at the official U.S. Central Exhibit at the International Trade fair held in Tokyo May 5 to 19.

N. H. Lou, mgr. of mfg., Parts Div., Reynolds Metals Co.

P. L. Lantz, production mgr., Abrasive Div., Norton Co.

Nils H. Lou has joined Reynolds Metals Co. as manager of manufacturing for the company's Parts Div. at Louisville, Ky.

Paul L. Lantz has been appointed production manager of the Abrasive Div. of Norton Company. He succeeds the late **George A. Fyrberg** who died April 6.

Paul W. Brannon is the new factory manager for the Chicago plant of Brad Foote Gear Works, Inc.

Promotions assigning changed or additional management responsibilities to five executives of the Sheffield Corp., Dayton, O., have been announced. **O. A. Ahlers,** senior vice-president, has been given the over-all direction of the machine tool, contract manufacturing and Threadwell-Conway tap and die product divisions. **W. Fay Aller,** previously vice president of the Auto-metrology div., was appointed vice-president to supervise and coordinate the company's Autometrology, standard production instruments, and fixed gage and inspection instruments divisions. **J. T. Welch,** who has previously served as general manager of the machine tool division, has been named assistant vice-president for coordinating the operations of the company's national field sales organizations. Welch will report to **C. H. Reynolds,** senior vice president, who will also have charge of the company's manufacturing facilities in Mount Clemens, Mich., Cleveland, O., and Windsor, Ontario, Canada. **William I. Wilt,** formerly general manager of the standard production instrument division has been advanced to assistant vice president of this division.

Left to right, O. A. Ahlers, senior vice-president, Sheffield Corp.; W. F. Aller, vice-president Autometrology div.; J. T. Welch, asst. vice-president, natl. field sales organizations; W. I. Wilt, asst. vice-president, standard production instr. div.

New, Lightweight, Powerful

FLEXIBLE TOOL SHAFT

Connects To Any Motor

Stow flexible tool shafts increase precision, eliminate operator fatigue on production grinding, polishing, sanding and other finishing operations in which the operator must hold the tool for long periods of time. Up to 3 HP can be transmitted through these new tool shafts, which consist of a core made of highest grade music wire rotating inside a rubber-covered casing. Each shaft furnished with ball bearing motor connection and high-speed ball bearing handpiece with removable wheel Arbor having ½-20" threads. An angle head can be used in place of the handpiece as shown in the photograph.

Four Sizes of these shafts are available . . . models 38, 40, 50 and 63, which come in 6-foot standard lengths. The largest shaft, model 63, will handle 3 HP at speeds up to 6900 RPM and has a maximum capacity for various accessories as follows: grinding wheel, 8"x1"; buffing wheel, 8"x1"; sanding disc, 9" diameter; sanding drum, 6"x2½"; wire brush, 8"x2"; steel drills, ½" diameter.

Write for Catalog 57

STOW MANUFACTURING CO.

310 Shear St. **Binghamton, New York**

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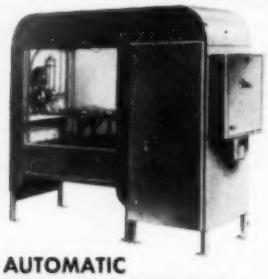
NEW!

METPAR RECIPROTRON

Patent Pending



AUTOMATIC DEBURRING MACHINE

Exclusive push-pull action.
Deburrs, polishes, micro inch finishes racked parts in minutes.
New Submerged Machines
Grind, burnish and rinse in one drum.
Dual Purpose Machines
Loose or fixtured tumbling.
Standard equipment in all sizes.

EQUIPMENT METPAR FOR TUMBLING MATERIALS

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WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION
333 Nassau Avenue Brooklyn 22, N. Y.

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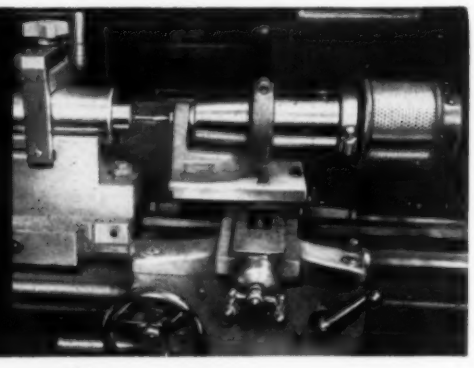
production time Reduced 48½% at Atlas Press Co.
Kalamazoo, Michigan



with a *Precise* SUPER 60

Case History M-102

PROBLEM: Internal milling of drill press taper quill 1⅛". Tolerance: TIR on master arbor, .0002" one inch out and .001 four inches out on arbor.

FORMER METHOD: Grinding with tool post grinder. Production — 10 pieces in 5⅓ hours.

PRECISE SOLUTION: Super 60 Power Quill, with filtration unit, using PMW 1032 Micro Mill. Production — 10 pieces in 2¾ hours.

HIGHLIGHTS OF SUPER 60 POWER QUILL

SUPER SPEEDS to 45,000 RPM — delivers full ½ H.P. at a load speed of 24,000 RPM.

EXTRA POWERFUL MOTOR allows heavier feeds and faster material removal — ideal for production set-ups.

ALL-STEEL HOUSING, precision ground and honed, only 2½" D. and 9½" overall length.

PRECISION COLLET CHUCK, ground and honed — up to ¼" size.

Available with COMPLETE LINE of MOUNTS, FILTRATION UNITS, and ELECTRIC SPEED CONTROLS.

Used SINGLY or perfectly adapted to MULTIPLE SET-UPS.

For complete specifications of the SUPER 60 POWER QUILL, and other PRECISE Power Tools from ⅓ to 1½ H.P., send for Free Catalog.

Precise

PRECISE PRODUCTS CORP.
3735 BLUE RIVER ROAD, RACINE, WISCONSIN
QUALITY AND PRECISION SINCE 1882

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NEWS OF INDUSTRY *continued*

Henry S. Harrison has been appointed plant superintendent for the machine and tools division of Michigan Tool Co., Detroit. **John I. Ross, Jr.,** was appointed sales and engineering representative in central Illinois.

Frank M. Mansfield III, formerly manager of product planning and market research for General Electric's Metallurgical Products Dept., Detroit, has been named sales manager and vice president for Wagner Bros., Inc., also of Detroit. **W. R. Nolf,** plant superintendent of the Nuclear Products Div., American Car & Foundry Co., Buffalo, has been appointed plant manager for Wagner's Dix Ave. plant.

Julius C. Hydrick has been appointed Assistant General Manager of Riverside-Alloy metal div., H. K. Porter Co., Inc.

J. Waldron Julian has been elected to the office of assistant treasurer of Besly-Welles Corp.

K. H. Pierce, sales mgr., Precision Castparts Corp.

Ralph W. Updegraff, gen. supt., Canton and Gambrinus bearing plants, Timken Roller Bearing Co.

Kenneth H. Pierce has been appointed sales manager for Precision Castparts Corp., Portland, Ore.

William M. Combs has been appointed vice-president of the Gulf division of the Walworth Co.

Ralph W. Updegraff has been appointed to the position of general su-

Carbide Form Grinding, Inc.
Specialists in Die Sections and Cutting Tools.
1406-45th St. Brooklyn 19, N.Y.

SALESMEN, SALES REPRESENTATIVES DISTRIBUTORS—JOBBERS
Your proven exp. & know-how selling Coated Abrasives & our outstanding German "Hermes" line can be the right combination. Metropolitan & many wide territories offer real oppty. If you have what it takes our proposition will be just what you're looking for.
Box No. 11, GRINDING & FINISHING Wheaton, Ill.

perintendent of the Canton and Gambrinus bearing plants, Timken Roller Bearing Co. He is replacing **Wilbur L. Young,** who has resigned.

James S. Tomlinson was elected executive vice president of General Abrasive Co., Inc. at the May meeting of the board of directors, held at the offices of the company in Niagara Falls, N.Y.

George Hohwart, left, vice-pres. mfg., N. A. Woodworth Co., R. W. Chadwick, vice-pres., sales.

George Hohwart, factory manager, and **Robert W. Chadwick,** sales manager, have been elected to the board of directors of N. A. Woodworth Co., Ferndale, Mich. Hohwart was also elected vice-president of mfg. and Chadwick vice-president of sales.

Charles B. Claspill, Detroit district manager for the Precision Grinding Wheel Co., Inc., retired on March 15. He had been associated with the company for the past 28 years. **Milton C. Veris** and **William C. Black** have been appointed sales representatives in the Chicago area. **William M. Wood** has been reassigned as sales representative in the Cincinnati-Dayton-Columbus area.

Preston D. Liebig has joined the J & S Tool Co., Inc., Livingston, N.J., in the capacity of chief engineer.

Herbert J. Niemann has been appointed sales engineer for Pangborn Corp., Hagerstown, Md.

Frank J. Spain has been appointed district manager for the Cortland Grinding Wheels Corp. and will have the western part of New York State and the entire State of Michigan under his supervision. His headquarters are in Rochester, N.Y. **Donald B. Alexander** has been appointed sales representative for the western part of New York State with headquarters in Rochester. **Philip H. Blanchard** has been appointed sales representative for the northwest part of Michigan, with headquarters in Flint. **Donald S. Taggart** has been appointed sales representative for part of the southwest Texas territory with headquarters in Houston. **John T. Davis** has been appointed sales representative in the Chicago area, with headquarters in Chicago.

P. D. Liebig, chief engineer, J & S Tool Co., Inc.

Frank J. Spain, district manager, Cortland Grinding Wheels Corp.

Arthur W. Miller has been appointed sales manager of the area served by the Nashville plant of the Solar Steel Corp., Cleveland, O.: Tennessee, Mississippi, Alabama, Georgia, North and South Carolina, and Florida.

Four new sales appointments have been announced by Raybestos-Manhattan, Inc., Passaic, N.J. **T. W. R. Latham** has been made Los Angeles district manager. **S. V. V. Hoffman,** who functioned as Los Angeles district manager pro-tem, remains as western region manager. **J. M. Ehman** has been appointed Birmingham assistant district manager. **Nevin L. Rush** has been appointed manager, distributor sales, Philadelphia district. **Julian P. Chilcote** has been appointed sales representative in the New York district.

George A. Fyrberg, production manager of Norton Company's Abrasive Division, died suddenly April 6.

Carl P. Cronk has been named Director of Marketing Research for National Electric Products Corporation.

Alan Moyer of Reynolds Metals Com-

Model E
12" - 16" Chucks

PARALLELISM *Plus**

* **MANUAL and AUTOMATIC** controlled hydraulic operation to work table. Can be arranged for complete automatic cycle grind.
* **TABLE MOUNTED Diamond Dresser** with dial control.
* **STEPLESS VARIABLE SPEEDS** to table and chuck rotation. Tiltable chuck.
* **HAND and AUTOMATIC WHEEL FEED** with power retraction.

Model E Hydraulic Rotary Surface Grinder (12 and 16" Chucks) has taken an honored place in the Arter Family of Machines after attaining a record of performance to which we point with pride.

ARTER GRINDING MACHINE COMPANY

WORCESTER • MASSACHUSETTS

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MARCUS B. CROTTS, LEFT, AND CHARLES L. SAUNDERS of Crotts & Saunders Engineering, Inc., Winston-Salem, N.C., which has been appointed as the Sheffield Corporation's representative for North and South Carolina and parts of Virginia.

pany has been named Milwaukee divisional sales manager, industrial sales.

Nickles Engineering Company has been appointed sales representatives for the New York State area for Fielden Instrument Division, Robertshaw-Fulton Controls Company.

R. J. Jablonski, carbide design and application engineer for General Electric's Metallurgical Products Department, Detroit, has been appointed sales representative for Carboloy cutting tools in the Flint, Mich. area.

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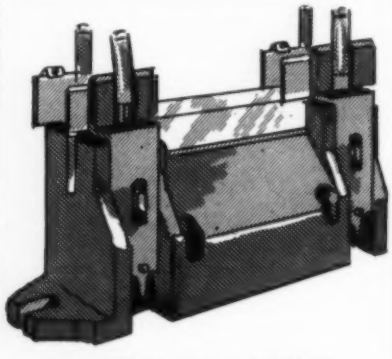

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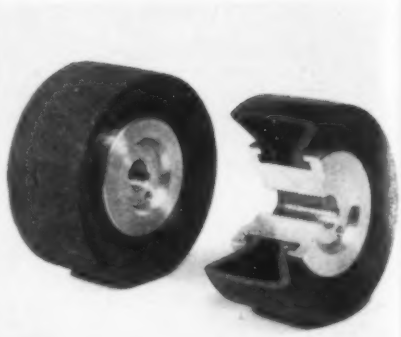

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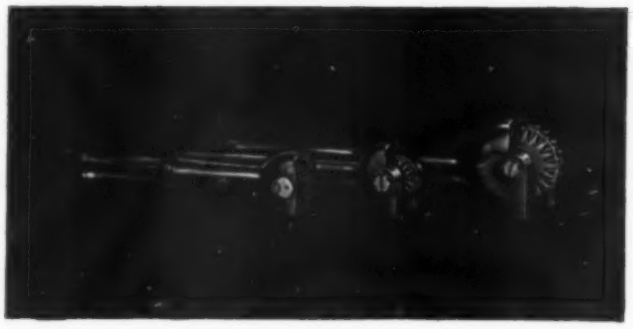

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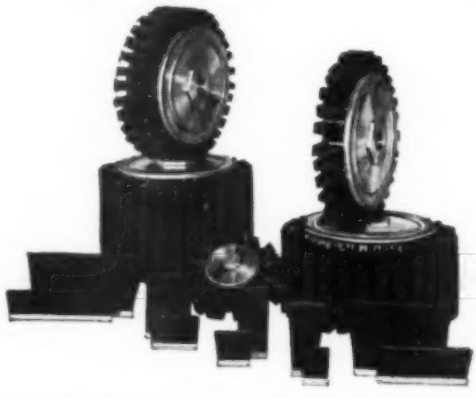

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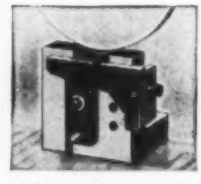

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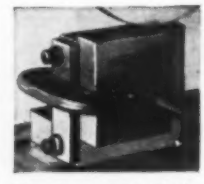

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Index to Advertisers and Products

A

Aget Mfg. Co. (Dust Collectors) 74
American Chain & Cable Co.
Allison Div. (Abrasive Wheels) 90
Anderson F. E., Oil Co. (Coolants & Lubricants) 6
Arter Grinding Machine Co. (Grinders) 95

B

Barnes Drill Co. (Honing Tools) 16a
Bay State Abrasive Products (Grinding Wheels) 24, 25
Bearings, Inc. (Spindle Repair Service) 70
Besly-Welles Corp. (Grinders) 21, 22, 23
Blanchard Machine Co., The
Grinders Div. (Grinding Machines) 16d
Bryant Chucking Grinder Co. (Grinders) 12, 13

C

Carborundum Co. (Bonded Abrasives) 52a, 52b
Chicago Rubber Co. (Rubber Contact Wheels) 84
Chicago Wheel & Mfg. Co. (Mounted Grinding Wheels) 19
Cincinnati Milling Machine Co. (Grinding Wheels) 4, 5
Cincinnati Milling Products Div. (Cutting Fluids) 66
Clark-Cutler-McDermott Co. (Machine Mounts) 10
Cleveland Grinding Machine Co. (Grinding Machines) 86
Clipper Diamond Tool Co. (Diamond Wheels) 92
Cortland Grinding Wheels Corp. (Grinding Wheels) 64
Crane Packing Co. (Lapping Equipment) 58
Crystal Lake Grinders Co. (Grinding Machines) 99

D

Desmond-Stephan Mfg. Co. (Abrasive Belts) 97
Dessau, Maurice S., Co. (Diamond Tools & Wheels) 56
Di-Met Corp. (Carbide Finishers) 85
Dumore Co. Grinding Div. (Grinding Machines) 63

E

Engis Equipment Co. (Lapping Machines) 65
Excello Corp. (Grinding Spindles) 52
Exolon Co. (Abrasives) 20

F

Field Co., Inc., Wm. H. (End Mill Grinders) 71
Form-All Mfg. Co. (Contour Rectifier) 78

G

Globe Trading Co. (Work Rests) 96
Grinding & Polishing Machinery Corp.
(Grinders, Buffers, Polishing Heads) 97

H

Hammond Machinery Builders (Double Spindle Lathes) 87
Hanchett Mfg. Co. (Metal Saw Sharpeners) 74
Harig Mfg. Co. (Surface Grinders) 57
Heald Machine Co. (Internal Grinding Machines) 2nd Cover 1, 2
Hill-Acme Co. (Grinding & Polishing Machines) 26

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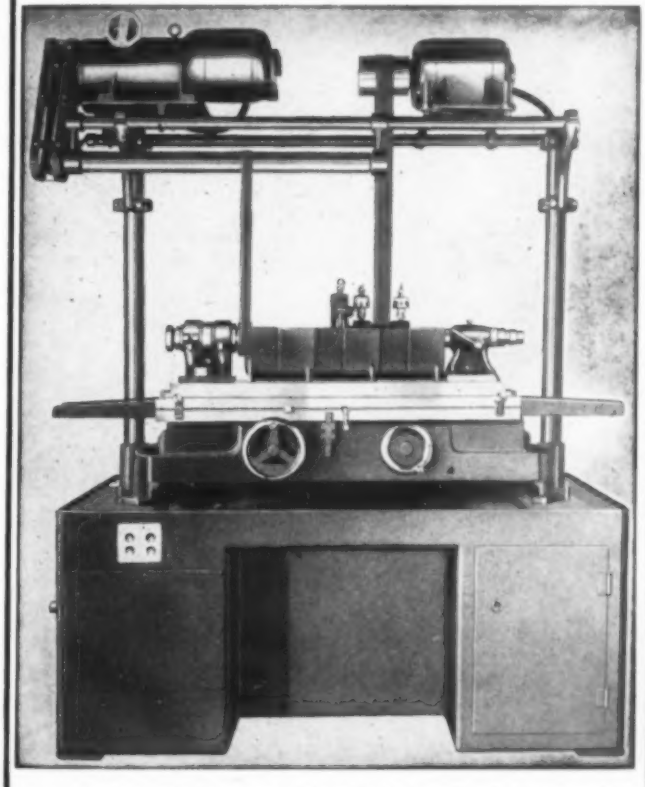

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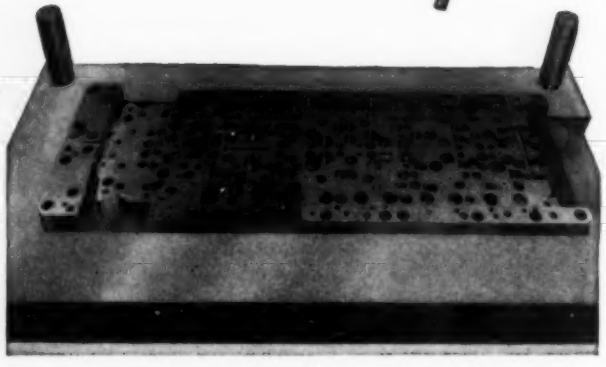

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I

International Refining & Mfg. Co. (Coolant & Grinding Compounds) 77

J

J & S Tool Co., Inc. (Wheel Dressers) 73
Johnson & Son, Inc., S. C. (Coolants) 68a
Jones & Lamson Machine Co. (Grinding Machines) 4th Cover

K

Kay & Warren Co. (Industrial Diamonds & Diamond Products) 99
Kirk & Blum Mfg. Co. (Dust Collectors) 79
Kuzmick Co., Paul L. (Diamond Wheels) 68

L

Lassy Tool Co. (Angle Plates) 98
Lea Michigan, Inc. (Bonding Cement) 74
Lee Co., K. O. (Motor Driven Work Heads) 97

M

Manhattan Raybestos Co. (Abrasive Wheels) 7
Mattison Machine Works (Surface Grinders) 38
McDonough Mfg. Co. (Tool & Cutter Grinders) 78
Metal Parts Sales Co. (Deburring Machines) 94
Michigan Abrasive Co. (Abrasive Belts) 55
Micromatic Hone Corp. (Honing Tools & Machines) 80, 81
Micrometrical Mfg. Co. (Microhoning Equipment) 92
Minnesota Mining & Mfg. Co. (Abrasives) 11
Moore Special Tool Co. (Jig Grinders) 82

N

National Broach & Machine Co. (Gear Honing Equipment) 53
Norton Co. Grains Div. (Abrasives) 59
Norton Co. Wheels Div. (Grinding Wheels) 16b, 16c
NuMatic Grinders, Inc. (Grinding Wheels) 96

P

Pope Machinery Corp. (Motorized Spindles) 60
Precise Products Co. (Power Quills) 94
Precision Grinding Wheel Co. (Tunnel and Car-Bottom Kilns) 61
Production Machine Co. (Grinding & Finishing Machines) 76

R

R & A Machine Co., Inc. (Tap Grinders) 92
Raybestos-Manhattan, Inc. (Abrasive Wheels) 7
Reid Bros. Co., Inc. (Grinders) 28
Rivett Lathe & Grinders Inc. (Grinding Machines) 68b
Royal Master Inc. (Grinding Machines) 91

S

Simonds Abrasive Co. (Grinding Wheels) 9
Sopko & Sons, Inc., Wm. (Grinding Wheels Adapters) 98
Spitfire Tool Co. (Lapping Machines) 12
Sterling Grinding Wheel Co. (Grinding Wheels) ..... 3rd Cover
Stone Machinery Co. (Cut-off Machines) 88
Stow Mfg. Co. (Flexible Tool Shafts) 93
Sundstrand Machine Tool Co. (Magnetic Chucks) 72
Sunnen Products Co. (Honing Tools) 8
Superior Hone Corp. (Vertical Honing Machine) 89

T

Taft-Peirce Mfg. Co. (Magnetic Work Drivers & Chucks) 16, 17

U

U.S. Diamond Wheel Co. (Diamond Wheels) 96
U.S. Electrical Tool Co. (Buffers, Grinders) 83

V

Van Norman Machine Co. (Grinders) 14, 15
Vulcan Tool Co. (Jig Grinders) 100

W

Walls Sales Corp. (Belt Sanders) 94
White & Bagley Co. (Grinding Coolant) 18

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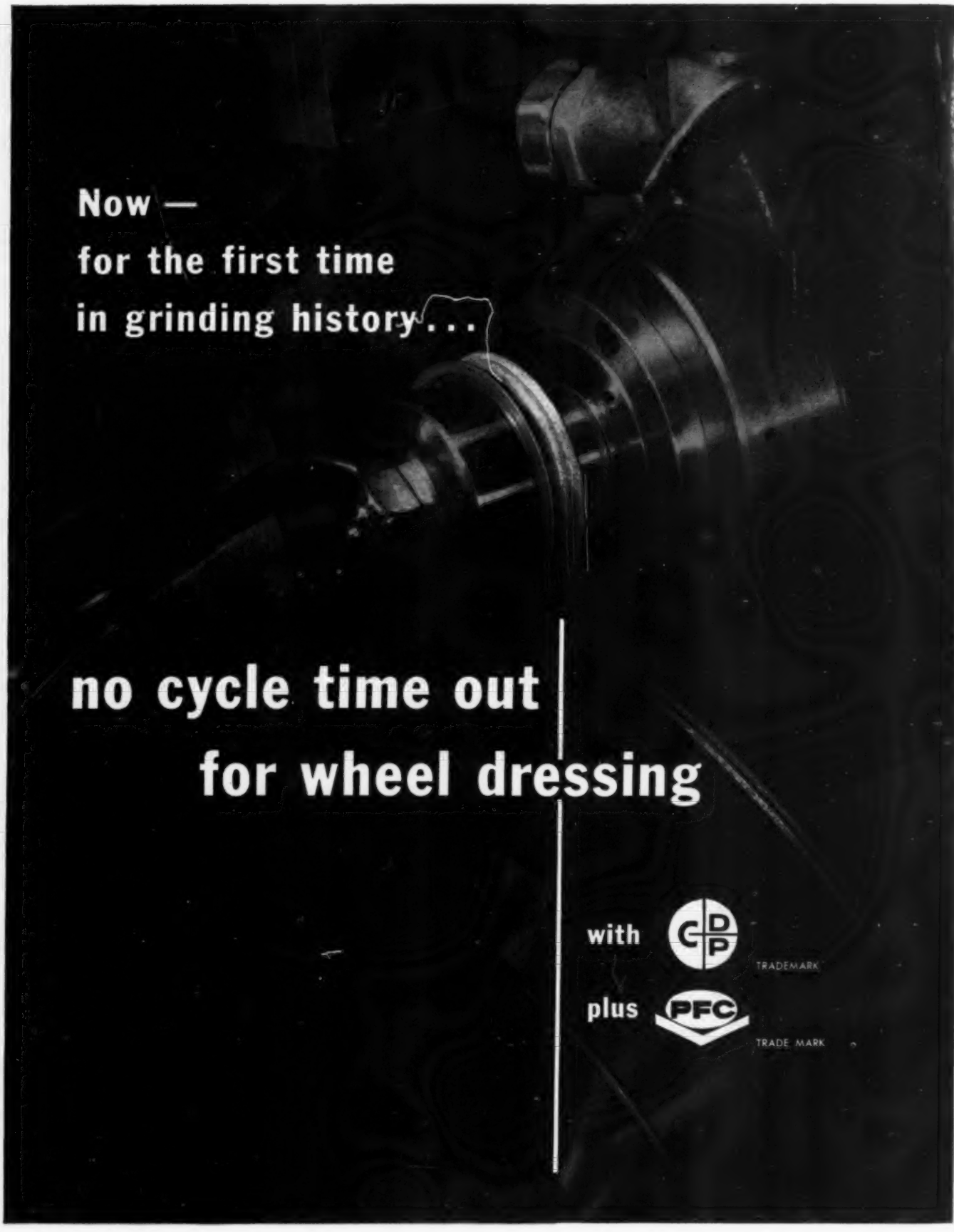

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